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Delivered before the North London Medical Society

BY SIR JOHN PHILLIPS, M.A., M.D. CANTAB., F.R.C.P. LOND.,

CONSULTING OBSTETRIC PHYSICIAN, KING'S COLLEGE HOSPITAL; EMERITUS PROFESSOR OF OBSTETRICS IN KING'S COLLEGE.

AFTER some introductory remarks, the speaker continued:—In applying these rays two important principles should be laid down: (1) an accurate diagnosis should be made of the condition present; and (2) owing to the complexity of the process the treatment should be carried out by an expert under the supervision of a gynæcologist.

DOSAGE AND ADMINISTRATION.

I have had the advantage of discussing the dosage and administration of X rays both with Dr. W. Ironside Bruce and Dr. Robert Knox, and have their permission to quote their individual methods briefly.

Dr. Ironside Bruce says:—

"I arrange to give in the case of myoma the maximum of X ray radiation. There are two factors which determine what is maximum.

1. *The skin.*—Even when using a filter, which in my practice is composed of several layers of thick felt, skin reaction is possible. The thickness of felt has been arrived at by gradual increase, watching the effects on the skin, so that the produced reaction is not more than inconvenient, and, of course, making sure that the therapeutic effect of the radiation is not diminished.

2. *The X-ray tube.*—If a large amount of current is used the tube becomes too hot and the penetrative radiations are no longer produced, at least, in bulk. Penetrative radiation is wanted, and I have found that with the tube I use 5 ma. can be "passed" for ten minutes, the tube remaining in an effective condition, provided that adequate cooling arrangements are made. The method now resolves itself into giving a number of exposures of ten minutes each, spread over a considerable time, in order that the effect on the skin may be watched—that is, if a skin reaction develops, before the number of exposures aimed at is reached, then one can stop and know that the skin is quite safe. The number of exposures which have been found to be effective is twelve." (*Vide* also Churchill's "System of Treatment," Vol. III.)

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Some improvement may follow the second treatment in nearly all cases; it is marked in the third. The cessation of menstruation marks the commencement of gradual improvement, with a general improvement in tone. Diminution in the size of the tumour is usually noted. To produce a satisfactory result in the average case takes from three to six months. These results can in special cases be expedited by giving heavier doses. I believe it could be done in one sitting, but on the whole I prefer to use the longer method, as it disturbs the patient less and is a more natural process. The results obtained are excellent in most cases."

In my own experience the immediate results of the sittings may be either:—1. Immediate cessation of menstruation without any return. 2. A profuse loss at the next menstruation and then entire cessation. 3. Gradual diminution in the amount lost, with final cessation. 4. Increase in the hæmorrhage temporarily. 5. No change.

The more remote effects of X rays are not at present clearly defined. For instance, what effect has a course on the action of the uterus, intestines, bladder, and other pelvic organs? There seems to be no doubt that not only does atrophy of the ovaries take place, but that there is some far-reaching effect on the uterine muscle, that probably the blood composition is in some way affected, and, lastly, that the general health of the patient may be in some way modified, usually by a feeling of improvement in tone. It has recently been found that many patients suffer more or less from nausea, without actual sickness. This has been attributed to the presence of ozone and may be relieved by inhalation of eau-de-Cologne. In three cases I find recorded that the patients suffered from attacks of faintness after the sittings. The menopause takes place quite gradually.

It was thought that the therapeutic value of X rays was due solely to their action on the ovaries, the ova, superficial and deep, being destroyed; although this is probably the chief result, the X rays have some influence on the muscular wall of the uterus itself, as in one of the cases detailed.

CLASSES OF CASES: RESULTS OF TREATMENT.

The classes of cases in which I have recommended the treatment are as follows:—

1. Fibroids of the uterus, whether producing hæmorrhage or pain or the subject of rapid growth.
2. Myofibrosis or metritis.
3. Carcinoma of the cervix, and as routine treatment before, during, and after complete extirpation of the uterus.
4. Colitis.
5. For sterilisation after Cæsarean section, in place of exsection of the tubes; also in severe dysmenorrhœa and osteomalacia.
6. Constitutional hæmorrhagic diseases (hæmophilia, purpura hæmorrhagica).
7. To promote absorption in old-standing chronic thickening.
8. Certain skin diseases of the vulva—namely, pruritus, leucoplakia, &c.

As an operator of more than 30 years' experience I have had many opportunities of watching the remote results of my own cases and those of others, and I have been struck with the fact that many, although brilliant immediately, have later not fulfilled the expectations of the operator; for instance, a hæmorrhagic fibroid may have been removed, yet although the patient has lost the hæmorrhages she remains a mental and often physical wreck. Again, ovaries and tubes have been removed for various pelvic conditions, and, although the operation has been skilfully and completely done, the patient's condition is either unaltered or may be somewhat worse than before the operation. These facts have necessarily made one ponder as to whether some less drastic treatment might not have been successful in these cases, and there is no doubt that a certain percentage of all pelvic disease may have been better and more satisfactorily treated by the exhibition of X rays.

Uterine Fibromata.

The exhibition of X rays in fibroids has generally been limited to those which have produced severe hæmorrhage and sometimes pain, the reason being stated that these are generally cases of interstitial myoma, and that submucous fibroids are better treated by surgical means; moreover, that the subserous forms are not amenable to X ray treatment. With these opinions I am not quite in accord. I have found that all varieties of fibroid, if properly selected, may be satisfactorily treated by X rays. I therefore propose to mention a few illustrative cases to substantiate my argument, taking for granted that the interstitial fibroid is the usual variety most likely to respond to treatment.

Details of the following cases were here given.

CASE 1.—Subserous pediculated fibroid, producing severe pain, failure to remove by abdominal operation and by radium, entire relief by X rays.

CASE 2.—Rapidly growing interstitial myoma with subserous nodules, X rays producing great shrinkage.

CASE 3.—Interstitial myoma in patient unsuited for operation; two sets of sittings brought about entire relief of symptoms.

CASE 4.—Combined submucous and subserous myomata in a patient in whom hysterectomy or severe operation was impossible, one course of X-rays resulting in extrusion of the submucous growth and its subsequent removal by surgical means. Complete amenorrhœa and shrinking of the subserous growth.

Another case showing the value of X-rays may also be mentioned. The patient, a middle-aged woman and suffering from a large myoma producing hæmorrhage, had undergone the operation of oöphorectomy, with the object of arresting menstruation; but the bleeding went on as before, and I recommended a course of X rays. The patient ceased menstruating, and has remained well for two years.

I have selected the above as illustrative of every variety of fibroid; each one benefited, I will not say permanently, by the action of the X-rays. They cannot, however, be called conclusive, as they are so few in number, and sufficient time has not yet elapsed to call them permanent cures. They have made, however, a great impression on my mind, and I certainly think that every case of fibroid tumour, either causing symptoms from rapid growth or hæmorrhage, should undergo a preliminary course of X-rays before definitely deciding on hysterectomy.

I have met with 19 cases of interstitial growths which, with three exceptions, have been so far almost entirely relieved of their symptoms by the X-rays, cessation of the hæmorrhages and shrinking of the tumour being well marked; I cannot yet give a reason for the failures. In one of them a very severe burn, followed by sloughing of the

skin, took place, and six weeks elapsed after a plastic surgical operation before even deep union took place. In one of the successful cases, the nerve shock of an air raid brought back hæmorrhage after six months amenorrhœa, but the shrinking of the tumour has steadily gone on.

As a rule, the best cases of fibroid to respond to this treatment are those occurring at the age of 40 or thereabouts, slow-growing, interstitial in position and producing either hæmorrhage, pain, or pressure symptoms, but I have recorded in my notes three cases occurring in comparatively young women—namely, aged 27, 29, and 32—where the tumour was first noticed owing to its rapid growth. There was in addition a slight excess of menstruation, but it could not be called flooding. In these three cases, after duly warning the patient of the possible outcome of the X rays—namely, sterilisation—the result was most satisfactory, as amenorrhœa occurred in all three, the tumour gradually shrank, leaving only an intrapelvic lump.

The class of fibroids which are obviously not suitable for this treatment are submucous pediculated fibroids and those affected with the various degenerations—namely, myxomatous, cystic, calcareous, necrobiosis or red degenerations, and infiltration from the endometrium of malignant disease. It is almost impossible to diagnose some of these degenerations, and the failures I met with are quite possibly due to the presence of one or other of these conditions.

Myofibrosis or Metritis.

These cases are distinguished by a general and equal enlargement of the uterus, due to uniform thickening of the walls. *The* symptom is practically more or less severe menorrhagia. It usually occurs after childbirth or a miscarriage, but may arise apart from either of these conditions. The important point is that curettage, which is usually carried out, makes the hæmorrhage worse, as anyone who has met with a case is well aware; it is very rare to find any marked disease of the endometrium when it is removed by the curette. Now this condition is particularly amenable to X ray treatment, and I have seen five cases in which one set of sittings produced an entire cessation of menstruation and a gradual atrophy of the uterus. It is obvious that before applying the treatment it would be safer in all such cases to explore the uterine cavity; in this way primary malignant disease of the body will be eliminated. This treatment was adopted in all five cases that I have mentioned.

Uterine Cancer.

The value of X rays in cancer of the uterus is at present uncertain; there seems to be no doubt, however, that the action of the rays is to limit or circumscribe the growth, and some cases have been reported in which the disease has been apparently cured, at any rate for some length of time. It has been suggested, therefore, that all cases of cancer, especially of the cervix, should be subjected to X rays before, during, and after operation, if possible. I have had experience of only two cases in which this treatment was partially carried out; they were both cases of cervical cancer, in which I performed total hysterectomy, and immediately afterwards they were subjected to a course of X rays. The first operation was performed three years and the second two years ago, and both, so far, have remained free from recurrence of the disease. It would be unwise to attribute this immunity to the X rays, but I think this course of treatment would be a good one to carry out in all such cases.

Colitis.

In treating cases of colitis with the X rays the disease itself is not the object of attack. I have frequently noticed in any bad cases of colitis that for 7–10 days before and during menstruation the disease is very much aggravated, and that during pregnancy, when ovarian activity ceases, the condition often becomes very much improved. Acting on this knowledge, it suggested itself to me that in very bad cases sterilisation of the patient might be beneficial, and I have recently had two instances of this treatment.

One was a case of hæmorrhagic colitis, with rapid emaciation and more or less constant diarrhœa. Every treatment at present known, both dietetic and otherwise, had been tried without avail. The only time of comparative freedom she had from the illness was during the week following the cessation of a period; the week preceding a period and during the actual flow the disease was always much aggravated. As she was 36 years of age and had had five children, it was felt that here was a case which might be benefited by sterilisation. She was therefore subjected to a course of X rays. This was carried out two years ago, and the result has been very satisfactory, menstruation has ceased, and the colitis has almost disappeared, but she still gets a slight return of the symptoms at the due time of the period.

The second case was one of ordinary colitis and followed the same course. Although, however, amenorrhœa has resulted and the colitis is much improved, sufficient time has not yet elapsed to call it a cure.

I think these two cases are well worthy of consideration. Allowing for the element of chance, they rather point to a hopeful termination in some of those intractable cases of colitis which occur so frequently in women. At the same time it must be distinctly stated that I do not recommend this treatment as routine practice in colitis.

For the Artificial Production of Amenorrhœa.

This includes treatment by X rays of cases such as severe dysmenorrhœa caused by non-development of the uterus. Those who have seen cases of this nature will bear in mind the great suffering such patients frequently endure: each menstrual period, from its first appearance, is like a miniature labour, often lasting two or three days. Dilatation of the cervix produces no relief of the symptoms and resort is necessary to drowning the pain by means of drugs. This method inevitably means increased doses of narcotics and lowering of the moral fibre of the patient. Hitherto, the only drastic treatment which has been recommended has been complete hysterectomy, but I think that sterilisation by means of X rays is a much more efficient method.

I have had one such case where the uterus, including the cervix, was only 1½ inches long. X rays produced complete amenorrhœa, and for the last 18 months the patient has been rapidly improving.

In another case of similar nature which I have just seen, and where the uterine cavity was slightly over an inch, the symptoms were even more severe. This patient is now going through a course of the same treatment, but I am unable, so far, to give the result.

The second class of case under this category is sterilisation of the patient as a part of the operation of Cæsarean section. As is well known, it is usual for the patient to be asked to decide whether she will be sterilised at the time of the operation, and, if she wishes it, exsection of a portion of each tube is carried out. I felt that sterilisation by X rays would be equally advantageous if successful, and in one case of this operation for pelvic contraction an excellent result has been produced, and I propose in any future case of Cæsarean section which comes under my notice to suggest this treatment to the patient.

Other Conditions.

There are other conditions which may be discussed with regard to the use of X rays—namely, some of the hæmorrhagic diseases, such as hæmophilia and purpura hæmorrhagica, in which very often menstruation is alarmingly excessive, sometimes requiring plugging of the vagina. I have one case of the former disease now going through a course of X ray treatment, but am unable to give the result of the treatment at present.

It has been suggested that X rays may promote absorption of old-standing chronic thickening in the pelvis, but of this I have had no experience, although I think it is quite likely that the results might be favourable.

And lastly, certain diseases of the vulva, such as leuco plakia and pruritus, are certainly benefited by X rays.

ADVANTAGES AND DISADVANTAGES.

I will next consider what are the advantages and disadvantages of its adoption, as compared with operation.

1. *Advantages.*—(*a*) The treatment is quite painless. (*b*) It occupies one to three months only, and if it fails operation can be carried out under the same conditions as before the sittings. (*c*) In a successful case the menopause which results is not usually attended by any of the nervous disturbances noticed in many cases of normal or post-operative menopause. (*d*) The cost is infinitely less than that entailed by operation. (*e*) Sittings may be given during menstruation without detriment, although some observers assert the contrary. (*f*) Bad after-effects are not so frequently noticed.

2. *Disadvantages.*—(*a*) The length of time which must necessarily elapse after the sittings have taken place before a permanent cure can be ascertained to have resulted. For instance, in some fibroids rapid shrivelling, in addition to cessation of the hæmorrhage, takes place; in others, the cure is not so rapid, and may require a second series of sittings, and even then the fibroid only partially disappears. Moreover, we are not yet certain that at some more or less remote period after the sittings there may not be a recurrence of the symptoms, although this is not common. (*b*) The danger of burning of the skin. This is practically a preventable accident, and I have no doubt that as improvements go on this will never occur. (*c*) The possibility of some malignant change taking place in the atrophied uterus or fibroid tumour.

In concluding these few remarks I can only say I have endeavoured to give my own personal experience, and as this is comparatively small and extends over only seven years, it would be unwise to dogmatise on results. I have therefore placed my facts before you for careful consideration, without wishing to influence you for or against the treatment. My own personal feeling is that in X rays we have a very powerful remedy, which, with increasing accuracy of diagnosis and administration, promises to be of inestimable value in the pathological female economy.

ON A GANGLION-NEUROMA OF THE MESENTERY.

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FOR many years I have been interested in large globular or ovoid tumours occasionally found in the subperitoneal connective tissue. Such tumours may grow in the immediate neighbourhood of the kidney or in the mesentery. To the naked eye they resemble a moderately firm uterine fibroid, and as a rule have been described as spindle-celled sarcomas (fibro-sarcomas). A few of these tumours may have been of this nature, but many are clinically innocent. I have followed up the subsequent history of some of the patients, and they have been free from recurrence many years after operation. A few years ago Turnbull, and subsequently P. Paterson,[1] published some observations on ganglion-neuromas of the mesentery. These were tumours of the size and shape of coco-nuts enucleated from the mesentery. On microscopic examination the tissue of the tumour contained nerve-cells and nerve-fibres. On becoming acquainted with this discovery I initiated a systematic histological examination of some so-called fibro-sarcomas of the abdomen in my possession, and especially one removed from the mesentery of a young woman. None contained nerve-tissue of any kind.

In 1917 a boy, aged 10, came under my care with double talipes equinus (a sequel of infantile paralysis) and a large abdominal tumour. In his fourth year an attempt was made by a surgeon to remove the tumour; in the course of the operation the capsule was found to be so beset with large veins, and the tumour itself seemed so firmly fixed to the spine, that he decided to leave it and closed the incision. The tumour grew, and as the parents wished for something more to be done, I decided to attempt its removal. When exposed by means of a free median sub-umbilical incision this tumour was found to be encapsuled between the layers of the mesentery. The capsule contained a number of large veins, but the bleeding was easily controlled and the tumour shelled readily. The boy made a quick recovery and remains well.

The tumour, in shape and size, resembles a coco-nut and measures 15 by 10 cm. Externally it is firm and yellowish like a uterine fibroid, but soft in the middle. I suspected it to be a ganglion-neuroma, and some pieces were prepared and examined by Dr. Browning in the Pathological Institute of the Middlesex Hospital. Nerve-cells were abundant. (Fig. 1.) Medullated nerve-fibres were displayed with the help of Levaditi's silver method. (Fig. 2.) Sections prepared from a strip of tissue involving the soft core and the periphery of the tumour displayed nerve-cells throughout.

FIG. 2.—Ganglion-neuroma. Nerve fibres and ganglion cells. Levaditi's silver method. (× 850.)

As some remarkable examples of ganglion-neuromas have been described in connexion with the adrenals, I made a thorough examination of the abdomen during the operation and satisfied myself that the tumour had no connexion with these organs.

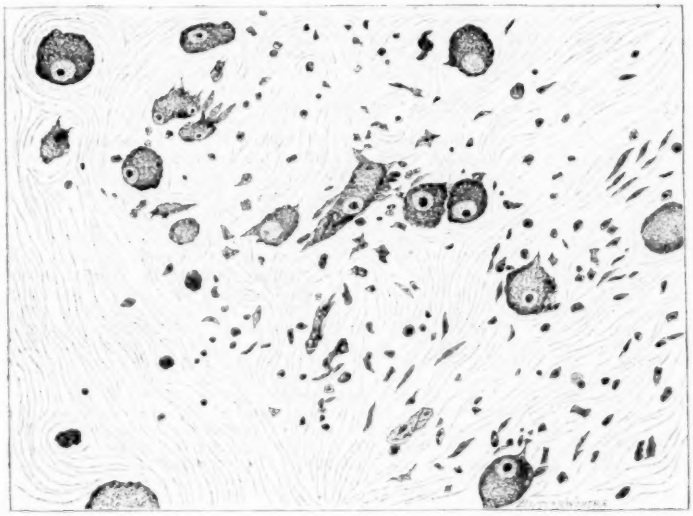

FIG. 1.—Ganglion-neuroma. Ganglion cell. Nissl's staining. (× 350.)

A useful paper on ganglion-neuromas of the mesentery and the adrenals has been published by John Shaw Dunn. He collected the literature and tabulated the reported cases.[2] Among the 60 records tabulated by him 48 were reported since 1900; of these 35 were observed within the last ten years. Ganglion-neuromas of large size are more common in children than adults. They are rare in the mesentery, and in this situation appear only during childhood and adolescence. Clinically they are innocent.

Ganglion-neuromas of the adrenals display malignancy in its worst forms, for they disseminate. These tumours are composed mainly of tissue resembling undifferentiated sympathetic neuroblast; ganglion-neuromas of this type are in consequence called neuroblastomas.

It is well known that some ovarian and testicular teratomas contain nerve-tissue indistinguishable from the grey matter of the brain. The majority of such tumours are innocent, but some display malignancy and disseminate. It is not improbable that these ganglion-neuromas are embryomas in which neuroblastic tissue preponderates, and it is well to note that the typical mesenteric ganglion neuromas occur in children and adolescents.

Brook-street, W.

[1] THE LANCET, 1913, ii., 997.

[2] Journal of Pathology, 1915, xix., 456.

TWILIGHT SLEEP: ITS ADVANTAGES AND DISADVANTAGES.[1]

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[AFTER some introductory remarks on the prominence given of recent years to twilight sleep, the action of scopolamine alone was considered, observations of Cushny being quoted. The death-rate from scopolamine-morphine narcosis in surgical practice was mentioned, and the fact emphasised that this combination when used without any other anæsthetic may have very dangerous results.]

TECHNIQUE.

The technique of the method of producing twilight sleep, as described by Krönig and Gauss, is, shortly, as follows. The initial dose is given when the pains of the first stage are recurring regularly every four or five minutes and lasting some 30 to 45 seconds, as estimated by placing the hand upon the uterus. It consists of 1/150 gr. of scopolamine hydrobromide and ¼ gr. of narcophine or ¼ gr. of morphia hydrochloride. It is of the utmost importance that a thoroughly reliable preparation of scopolamine should be used; it is difficult to prepare, and the various preparations vary a good deal in their action, and possibly to this fact some of the bad results which have been obtained are to be attributed. A stable preparation should be used which has been standardised. Three-quarters of an hour after the first dose a second of 1/150 gr. of scopolamine only is given. So far the treatment is the same for all, but the further dosage varies for each patient, and according to Gauss if good results are to be obtained must be determined by what he calls the memory test.

Scopolamine has the power not only of producing a certain degree of analgesia but also of interrupting the mental associations. It is held very strongly by those who have most experience of this method that the dosage must be regulated by the memory test, but it is instructive to note that many observers, including several members of the committee who took part in the recent investigation into this subject initiated by the Obstetrical Section of the Royal Society of Medicine,[2] found the memory test unreliable and unsatisfactory. It has the further disadvantage that it requires the rousing up of the patient each time that it is applied. Gauss, however, lays great stress upon it, and insists that the success or failure of the treatment stands or falls by the observation of this one test. It is interesting to observe that the routine method of administering a certain dose of scopolamine and narcophine at certain intervals of time without any reference to the state of the patient's memory is reserved in the Freiburg clinic for those women whom they euphemistically term their "third-class patients."

When the memory test is employed, half an hour after the second injection the woman is asked if she has had an injection, or if she remembers some object which was shown her at the time when the second injection was given. If the memory is still retained a third dose of scopolamine, 1/200 gr., is given, and further doses are given at varying intervals, depending upon whether the memory is retained, is dubious, or is lost.

Amnesia is the condition aimed at, and it is obvious that the application of the memory test requires a good deal of experience and intelligence on the part of the interrogator. Usually after the second or third dose the patient is unable to remember anything which has happened some 15 minutes before. During a uterine contraction the behaviour of the patient often would lead one to believe that she was appreciating the pains, but if at the end of the contraction she has no recollection of pain her condition of amnesia may be considered satisfactory. In order to lessen sensory impressions as much as possible the room should be darkened, all noises avoided, the patient's ears plugged with cotton-wool, and at the actual moment of the birth her face covered with a towel, as it has been shown that if these precautions are not observed excitement is more likely to occur.

The number of injections required varies a good deal: 3-6 is a fair average, but in one case reported by the committee as many as 53 were given. The amount of the maximum dose which should not be exceeded is more important. Gauss considers 1/15 gr. scopolamine the maximum, but he recommends as a rule an amount not exceeding 1/20 gr. in any one case. He has, however, given as much as 1/3 gr. without any bad results. One-third of a grain of morphia should never be exceeded, and only 1/6 gr. should be given in an ordinary case.

As I have mentioned, the memory test is difficult to apply, and not always to be depended upon, but so far there is nothing which can replace it with certainty. It has been suggested that use may be made of the degree of dilatation of the pupil or the presence or absence of Babinski's reflex. Neither of these is, however, satisfactory, and if the memory test is not employed the practitioner must fall back upon his knowledge of the condition of a patient when she is sufficiently under the influence of the drug to be in a state of complete amnesia. It is important to bear in mind that the abolition of memory is what is aimed at, not the abolition of pain, and complete analgesia must be regarded as evidence of overdosage.

In the 302 cases recorded by the committee complete amnesia was obtained in some 48 per cent. and partial amnesia in some 35 per cent. In 4214 recorded cases complete amnesia is claimed in 58·9 per cent.

It is often advisable when the head is escaping over the perineum to give a little chloroform or the patient may appreciate and remember these pains, and if this occurs the lasting effect of the previous condition of amnesia is likely to be lost.

EFFECTS OF THE DRUGS.

We may, I think, admit then that this method of scopolamine-morphine narcosis is capable of producing complete or partial amnesia in some three-fourths of all suitable cases when it is carried out with a proper technique. If this is admitted, what are the objections to its general employment? Before answering this question we must consider a little more fully not only its action upon the central nervous system in producing a condition of amnesia, but also its effect upon the other organs of the body, including the pelvic organs.

General Effects.

When the patient is under the influence of the drugs the most marked symptoms which may occur are congestion of the face, headache lasting for one or two days, intense thirst due to the arrest of the salivary secretion, nausea, vomiting, increase in the pulse-rate, slowing of the respirations, and at times a considerable degree of restlessness with mental confusion and even delirium. In some patients the excitement takes the form of hysterical convulsions, which are due rather to a nervous predisposition on the part of the patient than to the direct action of the drug. It must not be supposed that such results are a common accompaniment of twilight sleep; they are not, but they do occur from time to time, and may form a serious complication.

Of the 135 cases recorded by Ley thirst was present in 63 per cent., nausea and vomiting in 24 per cent., restlessness in 25 per cent., mental confusion in 24 per cent., excitement in 35 per cent., and a small proportion of these last were maniacal. It is very necessary to insist upon the fact that the toxicity of scopolamine varies very markedly in different individuals, and the effect of the first dose upon the patient should be watched very carefully, and if any untoward symptoms arise no further dose should be given.

Bardeleben maintains that the action of scopolamine is at times a dangerous one and relates a case ending fatally.

> The patient in whom the action of the drug, so far as the amnesia was concerned, had been very successful, had a severe hæmorrhage between one and two hours after her confinement, and died in a state of coma with a very feeble pulse. He regarded the case as one of intoxication from the drug, and stated that the condition of the patient was not like that of a woman dying of hæmorrhage.

Gauss, on the other hand, states that in an experience of 1000 cases in 70 per cent. the amnesia was perfect, and that he has not met with either headache, vomiting, or cyanosis. He does not admit that scopolamine is a cardiac poison, he has not experienced any modification of the pulse, and far from regarding it as contraindicated in pulmonary affections, on the contrary he advises its use in such cases. In the cases reported upon by the committee no noteworthy alteration of the pulse-rate or respiration-rate was noted, so that it is probable that such disturbances are the exception and not the rule. At the same time it must be remembered that very marked reactions have been recorded with as small a dose as 1/300 of a grain, and that there is no certain means of ascertaining the presence of any special idiosyncrasy to the drug in any particular patient.

Effect on Uterine Contraction.

If we now pass to a consideration of the effect of the drugs on the uterine contraction we find a more general agreement among different observers. [The opinions of the reporters to the Obstetrical Section and of other observers were given, and among other remarks the speaker said: It will probably be a fair computation if we say that in some 20-30 per cent. of the cases the duration of the labour is pro-

[1] Being a paper read at the opening of a discussion at the Hunterian Society on March 6th, 1918.

[2] THE LANCET, 1917, ii., 897.

longed. When this is not due directly to uterine inertia it is the result of the weakening of the action of the abdominal muscles, with in many cases a complete absence of any bearing-down efforts on the part of the patient.] As a result of this the forceps-rate has been very high in many of the series of cases.

The frequent inability of the patient to expel the child spontaneously and the consequent necessity for the administration of pituitary extract or the application of the forceps forms a serious drawback, in my opinion, to the practice of twilight sleep. By some of its advocates pituitary extract is given as a routine in every case. Even this drug, so popular at the present time as a means of overcoming secondary uterine inertia, is not without its dangers. The powerful contractions which it produces are sometimes followed by a condition of marked inertia, and its use should always be accompanied by the administration of ergot so as to render permanent the uterine contractions produced. Quite recently two cases of spontaneous rupture of the uterus have been recorded in which the presentations and the pelves were normal, and in which 1 c.cm. of the pituitary extract had been administered hypodermically for secondary uterine inertia.

Those practitioners who admit, as some of the speakers at the Obstetrical Section did, that they treat nearly all their patients with twilight sleep and do not hesitate to deliver most of them with forceps appear to me to place themselves on the horns of a dilemma. Either scopolamine-morphine narcosis constantly produces uterine inertia, which forms a strong condemnation of the method, or they apply the forceps unnecessarily, which forms an equally strong condemnation of their practice. It is quite true that if the patient is left she will generally deliver herself in the end, but the cases I have quoted where the second stage, when uninterfered with, lasted 12, 15, and 18 hours show how tedious and prolonged such a wait may be. Some authors maintain, however, that the women will bear down if made to, but they experience no voluntary desire to do so as in a normal labour.

When we try to estimate the action of these drugs upon the third stage of labour we meet again with somewhat contradictory statements. Inasmuch as the delay in the second stage is due in some degree to the absence of the normal bearing-down efforts of the patient, which play but a small part in the expulsion of the placenta, we should not expect much interference with this stage, nor, indeed, does it appear to occur. Only one member of the committee found any prolongation of the third stage of labour, and this agrees with the general experience. A certain number of cases of post-partum hæmorrhage have been recorded, but not in a larger percentage than might be met with in women delivered under the influence of any anæsthetic.

There is no evidence that the course of the puerperium or the ability to suckle the child is in any way influenced.

Effect on Child.

While, as we have seen, scopolamine-morphine narcosis in a certain number of cases from its effect upon the mother interferes with the normal course of labour, its effect upon the child is still more marked, and, indeed, forms one of the main objections to its use.

A considerable proportion of the children are born in a condition of so-called oligopnœa or in a state of blue asphyxia. In a series of 1864 cases asphyxia occurred in some 13·7 per cent., while in a series of 1247 cases oligopnœa occurred in nearly 20 per cent. In a recently reported series of 1000 cases from the Freiburg clinic, there were 312, or 31 per cent., cases of oligopnœa and 30 fœtal deaths, or a death-rate of 3 per cent., and when we remember that all these were selected cases, this death-rate is certainly a high one. By oligopnœa is meant a condition in which the child, after one or two respirations, or even a cry, appears to be in a state of profound sleep, the heart beats are unaltered, while the respirations are slow and superficial, but interrupted from time to time by a deep inspiratory effort. The skin throughout remains a good colour, and if the child is kept warm or gently stimulated its breathing gradually becomes normal.

The condition of oligopnœa is for the inexperienced one of some danger because it is important to refrain from undue interference, as it is unnecessary and may do harm. That this condition of oligopnœa is to be attributed to the action of the scopolamine and not to that of the morphia seems to be shown by the certainty with which these infants react to comparatively slight stimuli, which is not the case in a newborn child suffering from the effects of morphia administered to the mother.

It is difficult to distinguish the cases of asphyxia which possibly are to be attributed to the action of the morphine or the scopolamine from those which are the result of the prolongation of the labour or of the interference required to procure the delivery of the child, but when large numbers of cases are observed that an undue percentage of cases of asphyxia occurs seems indisputable, even if they cannot all be attributed to the action of the drugs.

ADVANTAGES AND DISADVANTAGES.

It may be objected that I have laid undue stress upon the disadvantages of this method of narcosis and even exaggerated its risks and that my conclusions are drawn mainly from the experience of others and not from my own. This is not because I have not tried the effect of twilight sleep; on the contrary, when it was first introduced I administered it to a certain number of my private patients, but I soon abandoned its use, partly because my own results were not very satisfactory, but also because a study of the literature and of the results of others did not prepossess me in its favour.

I have dwelt in these remarks more especially upon its drawbacks and dangers because, from the encomiums which were passed upon twilight sleep by many of those who took part in the discussion at the Obstetrical Section following on the reading of the papers of the four reporters, one might well believe that there were no disadvantages or dangers attending it. I regard it of the utmost importance that such a view should not be allowed to pass unchallenged. The delivery of a patient in a condition of twilight sleep is not a process entirely free from danger. It requires a considerable amount of experience and of obstetric skill to carry out successfully, and if it is to be practised by anyone and everyone all over the country, as some of its advocates would apparently wish, there are bound to be disasters. One hears rumours of them already, but they are necessarily difficult to substantiate and are not likely to be published. I think it very important that women should realise that twilight sleep is not free from difficulties and even dangers both to themselves and to their unborn infants, and that in a considerable proportion of the cases in which it is employed artificial delivery is called for which cannot fail to increase the risk of that particular confinement both to the mother and to her child.

It is impossible for anyone with a knowledge of the results of obstetric practice to deny that an increase in the forceps-rate leads to an increase in the morbidity rate, and the morbidity rate cannot be raised without a corresponding rise in the number of gynæcological affections directly due to childbirth and without eventually a rise in the mortality rate. The safest possible mode of delivery for both the mother and her child is a spontaneous one, and this fact is established with complete certainty. Any method of narcosis which tends in a large percentage of confinements to lead to artificial delivery, and so interferes with what would be otherwise a spontaneous delivery, must increase the risk both to the mother and to her child.

The Credit Side.

If in summing up we attempt to draw up a balance-sheet, on the credit side we would have to place the fact that in some 60–70 per cent. of selected cases it is possible for a woman to be confined in a condition of amnesia, so that she has no recollection of her pains. This being admitted, the advocates of the method believe that this fact may tend to cause an increase in the birth-rate because women will no longer be deterred by the fear of the pains of childbirth from having babies. This is, of course, an arguable proposition; it must be remembered that many other considerations must be taken into account, and it is not by any means always the wife who is responsible for the small family nor does the fear of the actual confinement play so large a part in the minds of many women as the various discomforts associated with the nine months of pregnancy.

It is further asserted that the practice of twilight sleep saves the woman from the mental and physical shock of childbirth. But is there in an ordinary case of labour, and the method even by its advocates is not recommended in cases of complicated labour; is there in normal cases any degree of mental or physical shock? In my experience I should say that in most instances there is none at all, and that the present usual method of dealing with the pains of childbirth by the administration of an anæsthetic in the second stage is satisfactory and successful. In an ordinary case of labour there is no shock, and one of the most remarkable facts of midwifery is the ease and rapidity with which women forget the pains of their confinements.

The Debit Side.

Admitting that complete amnesia can be obtained in a large percentage of the cases, what is there to be placed on

the debit side of the balance-sheet? There would seem to be a large number of items.

In many cases the method is unsuitable, either because the patient is too advanced in labour or because the labour is a complicated one; or is unsuccessful because the attempt to induce amnesia fails.

To be carried out with the minimum of risk constant supervision is needed by the medical man himself; indeed, many of the most ardent advocates of the method maintain that the patient should not be left by the medical man after she has received the first injection.

A degree of obstetric skill above the average is called for on the part of the attendant, so that he may recognise the progress of the different stages of the labour, the subjective symptoms of which are often obscured by the condition of the patient. For this reason more vaginal examinations are required than are necessary in a patient not under the influence of twilight sleep, and this is not in accordance with the most modern obstetric practice.

The fact that some patients exhibit a marked idiosyncrasy to the action of scopolamine and become very restless or even delirious when under its influence renders the observance of rigid asepsis or antisepsis very difficult, while the fact that over 30 cases in all of death from scopolamine-morphine narcosis have been recorded in the literature shows how dangerous these drugs may be.

The condition of uterine inertia which at times results, the interference with the action of the abdominal muscles and of the bladder muscle, and the frequent necessity for artificial delivery either by forceps or by the administration of pituitary extract are not by any means in its favour. The further fact that a considerable number of children are born in a condition of oligopnœa, and also a smaller but still considerable number in a condition of asphyxia, is one of the most important arguments against this method of narcosis.

It is difficult to arrive at the actual fœtal death-rate. In most of the cases the death of the child is attributed to a variety of other causes, but an impartial review of the recorded cases demonstrates that it is higher than the normal, and when we remember the number of cases in which artificial delivery is required this is not surprising.

Looking at the two sides of this balance-sheet it seems impossible to escape the conclusion that the condition of scopolamine-morphine narcosis, known as twilight sleep, is not one which can be considered as free from dangers, that it is not suitable for general use, and that its disadvantages must be held to outbalance its advantages.

RADIUM TREATMENT OF SCARS:

WITH CLINICAL NOTES ON MILITARY ORTHOPÆDIC CASES.[1]

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ONE of the problems of military orthopædic surgery is the treatment of painful and adherent scars, which for the present purpose includes only simple fibrous-tissue formation and adhesions, the result of wounds and inflammation, and not the pathological changes which may supervene, such as keloid and epithelioma.

Troublesome scars can frequently be excised with the best and quickest results, but as frequently it is not desirable to touch them with a knife. Excellent results are obtained by gradual stretching of scars and adhesions by screw splints and elastic apparatus, or in suitable cases by forcible stretching under an anæsthetic, always with advantage combined with some means of more slowly but progressively freeing the part, and increasing its functional use and vascularity, such as curative work and exercises, massage, ionisation, hydrotherapy, and, as I have observed, treatment with radium. Large doses of hard X rays should act similarly, but personally I find radium more convenient to apply and safer to use on account of the accuracy with which the dose can be estimated, administered, and recorded for future reference.[2]

Radium, or rather the hard beta- and gamma-rays of radium B and radium C—I always use radium emanation as their source—appears to act as a true "fibrolysin." Clinically such radiation alters the consistence of the scar, making it soft and pliable, and apparently enables the surrounding adherent tissues to free themselves from the original tough fibrous mass.

Radium and X rays are undoubtedly the most potent and physical agents we possess for effecting metabolism of animal tissues. It has some action on every individual cell radiated. The effect, probably due to its ionising properties, is not merely local, as some of the hard rays of radium will not be stopped by several feet of human tissues. In this respect it has a great advantage over electrical ionisation, hydro-therapy, massage, &c., but I am far from suggesting that radium can replace their usefulness.

Two cases were here recorded in which was shown the analgesic effect of radium treatment, an important factor in its usefulness. Morson's[3] experience is similar.

That radium has a most powerful and rapid effect on the tissues and the blood-supply is beyond question. A patient I treated with emanation needles for a fungating growth in the floor of the mouth, involving under-surface of tongue, showed this in a most striking manner, quite obvious to all who saw it. Morson's micro-photographs confirmed the possibility of these rapid and definite changes.[3]

Illustrative Cases.

Radium affects normal as well as pathological cells. I have no knowledge of the histological changes it produces in scars. Clinically there appears to be a fairly rapid, but not a marked, œdema of the tissues. A red scar becomes whitish in 3–5 days and about the tenth day after treatment it turns to its former colour. During the white stage the scar is painless and the pain returns when the original red colour is restored. The anæsthetic effect is further illustrated by Case 4.

CASE 4.*—Pensioner in Blackrock Military Orthopædic Hospital. Longitudinal shrapnel wound over dorsum of first inter-phalangeal joint on left middle finger causing some bony displacement and involving extensor tendon. Little or no voluntary movement in joint which was held at angle of 125°. Any forced movements caused severe pain. He could move distal joint freely. I sent him to my house and applied 51·4 mc. (millicuries) of emanation in my applicator for three and a half hours. Immediately on its removal patient was delighted to find he was able to move joint freely, through an angle of 30°, which I verified by measurement on a graft. I could forcibly straighten finger and bring it to right angle at joint without hurting him, at least so he assured me.

There was no question of mental suggestion in this case; in fact, I did not expect much change for two or three days. The man thought he was wasting his time until he saw the effect of treatment. Personally, I am convinced I could not have obtained such a quick result, and I believe, permanent gain as far as movement goes, by any other method of treatment. But I also recognise that it is only a stage in the treatment, which must be supplemented by the patient's personal efforts in the workshops and general orthopædic treatment.

Besides four of the cases above eight others were treated with radium for scars during last August.

CASE 7.—Private B. was treated for painful adherent scar on front of right forearm on August 8th, 1917. Two days later scar was less adherent and less painful. On August 24th, 1917, marked improvement in whole forearm, less pain, and more power in hand, and drag of scar on dorsi-flexion of wrist was scarcely perceptible, though before treatment very well marked.

CASE 11.—Private M. had extensive scar firmly adherent to, and taking contour of broken right clavicle for about two inches of its centre. Unable to abduct arm to right-angle, and this movement caused great pain. He was treated on August 9th 1-17, by surface application for 18 hours of two applicators from London Radium Institute, each containing 24 mc. I quote the notes of Miss Despard,[3] masseuse in charge at Blackrock Hospital:—

"No improvement noticed for a day or two; after this there was no pain on movement of shoulder-joint, and movements of abduction and extension had improved greatly. The scar had become pale in colour and much softer. On 16th patient complained of pain on shoulder above and behind scar when touched and scar had deepened in colour, but movement in shoulder-joint, especially abduction, had improved. On August 29th, 1917, great improvement all round. Scar looser. Movements freer and stronger."

My note on the 28th states: "Scar very much freer and cicatricial area now nearly level with surrounding skin, and not depressed and markedly attached to collar bone as previously. Movements of arm much freer also and voluntary control of shoulder muscles distinctly increased in strength, improving power and usefulness of arm as a whole. He can abduct arm well above a right-angle. The marked action of the radium in this case would appear to be due to the removal of the inhibiting effect of the painful scar on the patient's voluntary movement."

Major W. S. Haughton, R.A.M.C., subsequently removed the scar, as it interfered with wearing of patient's equipment. Major Haughton tells me he was struck at the operation by the ease with which he was able to remove the scar and bring the skin edges together.

CASE 12.—Treatment with radium of scar on dorsum of foot of Private S. near big toe resulted in freeing scar from tendon and bone, with improvement in functional varus position of foot, and enabled him to touch ground with big toe.

* A number of cases are omitted owing to lack of space.

Dosage.—Result of Treatment.

Two cases showed that the question of dosage is of importance, as too large a dose may do more harm than good, while with a small dose the maximum benefit cannot, I believe, be obtained.

The dose I give is a large one, and ranges from three-quarters to seven-eighths of that which I know from experience of my apparatus in malignant cases will cause epilation, erythema, and sometimes blistering or slight ulceration of the skin. With the standards I employ the erythema dose is from 400 to 420 mc.h. (millicurie-hours). The applicator is a shallow box, its lower surface 2 by 3 cm. in area, the whole box and lid being made of lead 1·57 mm. thick. Before it is applied the whole box is covered with two layers of lint, or a slightly greater thickness of wool and a couple of layers of adhesive plaster, to cut off the soft secondary rays from the lead. This makes a package which covers and radiates about 3 by 4 cm. of the patient's skin, against which it is fixed by strapping and a bandage.

The radium emanation is supplied to me by the Royal Dublin Society Radium Institute in fine glass capillaries about 1·75 cm. long described elsewhere.[4 7] I distributed at least eight capillaries, evenly and parallel to one another along the bottom of the box, and fixed them in position by paraffin, thus obtaining, at the distance they are from the skin, a fairly uniform radiation.

The dose I employ per area treated for a thin part like the hand is about 320 mc.h., and for a more fleshy part 360 mc.h. For instance, utilising an average of 40 mc., the time it would be left on the hand is obtained by dividing 320 by 40—i.e., eight hours, similarly for the arm nine hours.

As the emanation in the applicators kindly lent me by Dr. J. E. A. Lynham from the London Radium Institute is less concentrated—i.e., the applicator is 4 × 4 cm., and is filtered to a greater extent by 2 mm. of lead, 40 mc. (equivalent to 40 × 1·81 mg. of $RaBr_2.2H_2O$, their standard of measurement) may safely be applied for 10 hours on the hand and 11½ on the arm.

If X rays are used for the treatment of scars, I would suggest as a suitable dose a full Sabouraud, or 8X of Kienboeck (an epilation, or 8/10ths of an erythema dose), measured after the rays have passed the filter of at least 1 mm. of aluminium.[8]

Most of the Blackrock cases reported above were patients of Major Haughton, and I am much indebted to him, Lieutenant-Colonel W. I. de C. Wheeler, and Major T. J. Potter, officer in charge, for the facilities they have afforded me in treating their patients and carrying out my investigations. I am also indebted to Miss Despard and the ladies of the Massage Department for their careful notes, as practically all the patients were attending there for treatment.

The improvement with massage and electricity, &c., is often so gradual that many patients profess to think that it is doing them no good, and they often become depressed. Any treatment, therefore, which gets them over the dead point or apparently stationary stage in the progress of improvement, as I believe radium treatment can in suitable cases, is of great benefit, not only on account of the actual improvement obtained,[7] but also because of its mental effect. I asked Miss Despard to give me a general statement as to the usefulness or otherwise of radium treatment from the point of the masseuse. Her report, dated August 30th, 1917, which, I think, states the facts very fairly, is as follows:—

"In every case, except one, of the patients under my care, who have been treated with radium, I have noticed an improvement in the mobility of the joints affected. The scars seem to become paler in colour, much softer and less adherent to the underlying structures; and massage treatment and exercises have been continued with much better results after an application of radium than before it. The patients complain of less pain in the scar on movement, and in some of the cases treated the improvement in mobility has been very marked."

Recent Unhealed Wounds.

The patients I treated in Blackrock, including 16 more recent cases, mostly hands, where similar effects were observed, were suffering from the effects of old healed wounds received in 1915 and 1916, and had been given months of massage and similar treatments in general hospitals and command depôts. During 1916 I used radium on some of my military patients in Dr. Steevens' Hospital for recent unhealed gunshot wounds. The results, I think, are worth recording, as they at least prove that small doses of radiation do no harm, and probably hasten the healing process and restoration of function.

CASE B.—Lieut. M. had painful sinus 5½ inches long extending from perineum to right femoral vessels for over two months. On June 27th, 1916, I inserted silver tube containing 9 mc. of emanation and radiated bottom of sinus, halfway down and near its external opening, leaving tube three hours in each place. I then re-inserted the drain. Next day increased amount of pus, but no pain. On July 4th no pus to be seen; I could not get in smallest rubber drain. From that date sinus healed.

CASE E.—On Dec. 12th, 1916, I inserted tube containing 4·4 mc. of emanation into sinus of bullet wound in front of Private A.'s right elbow for 10 hours—44 mc.h. My note four days later says: "Patient states as result of treatment more pus, but arm freed from soreness, and can flex it much better, and pronate and supinate it much easier."

CASE F.—On Dec. 13th, 1916, silver tube containing 3·6 mc. of emanation was left in two positions for six hours each in sinus of Private S., extending from outer side of left thigh to neighbourhood of sciatic nerve (total 43·4 mc.h.). Three days later patient stated that treatment had made him much freer and that he had much more feeling in his leg

I can vouch for the fact that these two men (Cases E and F), who were in different wards, were genuinely pleased with the results of treatment. The power of extension in the elbow and movement in the radio-ulnar joint were markedly increased in Case E, while the other patient used his limbs more freely and walked with greater confidence. Whether these results were due to an analgesic effect on the nerves, or some freeing of adhesions, or were simply psychological is a matter of conjecture, but, personally, I cannot attribute them to the last cause alone. I may mention that, in order not to vitiate the value of my observations, I never suggest to the patient what the effect of treatment may be, so as to eliminate the purely psychological. It is obvious that the effects of any treatment on subjective symptoms in such cases can be masked or exaggerated according to the temperament of the patient and the pessimism or optimism of the observer, however fair the latter may try to be. I have, therefore, entered rather fully into the question of dosage, so as to enable other workers to confirm or refute the value of this line of treatment.

Conclusions.

1. Radium has a distinct sphere of usefulness in the treatment of scar tissue and fibrous adhesions.
2. It is a valuable adjunct to other methods of orthopædic treatment, especially by shortening their duration.
3. Its effect is rapid, sometimes immediate.
4. It softens and mobilises scar tissue.
5. It appears to facilitate subsequent removal of the scar by the knife.
6. It enables structures, like tendons adherent to the scar, to free themselves.
7. By loosening tendons and stiff joints it improves the functional power of the part.
8. It possesses the advantage of acting, to some extent, as an innocuous local anæsthetic for about a week.
9. It is particularly useful in treating scars and adhesions in the hands and fingers.
10. It is easily applied to the surface of the skin, and by this method causes no inconvenience to the patient.
11. To obtain the best results a single large dose is necessary.
12. The dose should not be so great as to produce inflammation of the skin.
13. With suitable dosage it appears to produce no ill effects.
14. In small doses it appears to hasten the healing of wounds, and to allay the painful inhibitory effects of the products of inflammation.

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AFTER-EFFECTS OF GUNSHOT WOUNDS ON JOINTS.

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Grouping of Cases.

THE various disabilities in the function of joints following gunshot or shell wounds, excluding those caused by cicatrices and nerve lesions, may be roughly divided into three heads:—

1. Where the joint has escaped actual injury, but where the utility of it has been diminished or lost by the rest necessary for the proper healing of the wound.

Apart from the debility of the limb in general from wasting, a very common example of the first series is where rigidity, either from muscle stiffness or the presence of fibrous adhesions, exists in one or more of the joints of the injured limb. Amongst young soldiers this condition usually clears up fairly rapidly, but in men past 35 recovery may prove slow. At this age, in addition to the thinning of disuse, radiographs will often demonstrate arthritic changes taking place in the joints of the injured limb, wrist-joints and the fingers being especially troublesome in this respect.

A shoulder-joint rendered stiff by disuse and immobility as a rule makes a perfect recovery. Elbow-joints, on the other hand, especially if they have been kept a long time on the internal angular splint with the forearm midway between pronation and supination, frequently require great patience before a satisfactory result is obtained. It often happens, in spite of most active treatment, that some slight but painless limitation in the actions of extension, supination, or pronation remains, though the limb is otherwise quite strong and useful. Loss of power to use the hand and wrist commonly follows a wound of the arm, varying from complete loss of function, with fingers rigidly extended and devoid of even passive movement, to the cold, flabby, sweating, expressionless hand, where most movements are passively complete, but where volitional activity is entirely lost. Such cases usually do well, but, as formerly stated, with the exception of those past middle age.

With regard to the lower limb, the knee is the joint most commonly affected, and though in the case of the upper arm the shoulder is very liable to become stiff, it is rare to find impairment of the hip-joint following a wound of the thigh. Provided the radiograph shows no abnormality in the shape of arthritic changes or the presence of inflammatory products, restoration of function can usually be obtained. It is, however, easier to obtain normal flexion from a knee fixed in full extension than to get full extension from this joint where extension is the defective movement.

As in the hand, the ankle and foot impaired by disuse usually do well, provided care has been taken to prevent the foot dropping forward during the period of splinting. In such cases further surgical interference may be required, for the purpose of dividing or lengthening the tendo Achillis, before the normal range of movement can be restored. It may be stated that the first series of disability is of a far less severe type now, compared with those seen in the earlier phases of the war, when it was no rare occurrence to find shoulder, elbow, wrist, and fingers fixed by fibrous adhesions as a sequel to some wound of the arm.

2. Where there has been a fracture of one of the bones entering into the formation of the joint with and without implication of the joint.

Where the injury has been complicated by fracture into the joint in addition to the sequelæ already described, recovery in action may be lost or diminished by several conditions. In the first place, bony ankylosis may take place, when the question of excision of the joint may be discussed. Movements may also be hampered by alteration in the mechanics of the joint and its range restricted by bone displacement or the presence of callus in or round the joint. Where the defect is due to alteration in the joint mechanics treatment based on the same lines as in the simpler forms of ankylosis will often result in a strong painless joint, but with such limitation of movement as the new bone position permits. When, however, the block is due to callus the result may far exceed the expectations of recovery derived from a study of the radiograph or examination under anæsthesia.

Fracture wounds implicating the shoulder-joint are particularly liable to leave a bone block limiting movement, but the rotation of the scapula to a certain extent will increase the range and thereby improve the usefulness of the limb.

Elbows give, perhaps, the most satisfactory results, and, provided supination and pronation remain unaltered, many men injured in this way have returned to full duty.

Knee-joints and hips are distinctly unsatisfactory from a military point of view, since few will recover sufficiently to enable the men to maintain the activity necessary for soldiers.

The wrist, provided some of the carpal bones remain intact, do fairly well, but a firmly ankylosed wrist does not necessarily mean incapacity for service. Ankylosis of a digital articulation causes but little inconvenience, but where the metacarpo-phalangeal joint has become ankylosed, or limited by bony block in extension, a full grasp with the sound digits is usually deficient.

Many men whose ankle-joints have been slightly injured in this way become sound enough to resume full duty, but the majority have been unfit for further service in the field. Though in other regions pain is not, as a rule, a cause of complaint, fracture wounds of the tarsus and metatarsus always remain excessively painful.

With few exceptions the results of the cases I have seen have been unsatisfactory.

Compound fractures from gunshot wounds which have not implicated the joint at the time of the injury, apart from the disabilities that may arise from defective union or shortening, not infrequently give rise to considerable limitation of movement from matting of the soft parts round the seat of the fracture. This is particularly noticeable in fracture of the thigh, when movement at the knee is not infrequently limited to a slight rock. This may be further complicated when the fracture is in the lower third of the femur by dense inflammatory products choking the joint.

In such cases there is nearly always a history of prolonged suppuration and removal of sequestra. Many have been plated and in some cases plates have had to be removed at a later date. Latterly the severity of this type has appreciably diminished, as cases are able to come for physical treatment at a much earlier date than formerly.

In all types of impaired joint action the earlier that treatment for the restoration of function can be undertaken the better the chances are of a good recovery.

3. Where the joint has been penetrated without fracture or has been opened up for the removal of projectile.

Practically the only joint capable of being penetrated by a missile without fracture is the knee. Nowadays it is not uncommon to meet with men who, having sustained a through-and-through wound of the joint recover as if their injury had been one of slight traumatic synovitis. The less the local disturbance has been the quicker the recovery. Where suppuration in the joint has followed the wound prognosis is bad from a military point of view, though there will usually remain a painless joint with limited movement.

I have seen a case where a bullet remained entirely embedded in the external condyle of the femur, and once the superstition so prevalent among soldiers that a "foreign body" is a source of danger to life had been overcome the man made an excellent recovery with complete movements and strength.

When the joint has been laid open for the removal of the projectile the result mainly depends upon the length of time the wound takes to heal. If a prolonged suppuration precedes healing the chances of a good recovery are bad. Lately I have seen some cases which had been treated by the Carrel-Dakin method, where the joint had been opened for the removal of metal some days after the injury had been received, the condition of the joint being such that a sound functioning knee was almost certain.

Consideration of Certain Points.

Before giving a brief description of the physical treatment in use at the Croydon War Hospital and the special department of the Queen Alexandra Hospital, Millbank, it may be as well to emphasise certain points.

The sooner the wound can be got to heal the better the prognosis of a good result, as I have found that cases that have had to remain months in hospital are, as a rule, difficult to deal with, both mentally and bodily.

A certain amount can, and should, be done to prevent joints not directly implicated becoming stiff during the process of repair, though anything like full physical treatment is out of the question till all wounds and sinuses are healed. Therefore any method of treatment that tends to lessen the period of rest and shorten the course of suppuration is welcomed by those of us engaged on the after-treatment of these injuries.

Another important point is that, though massage in the early stages is of the utmost value, yet it is in many cases persevered with for too long a time. When, all wounds being healed, a joint remains with imperfect action and no appreciably increasing improvement is noticed after a month of skilled massage, the question of a more rigorous line of treatment should be considered.

Likewise at all stages, should any particular method of applying physical treatment fail to effect improvement, a change of the mode exployed will often bring about the desired result.

A combination of massage, electricity, and special exercises, frequently helps when any of the three tried singly has signally failed.

Description of Treatment.

Two divisions of the Croydon War Hospital were set apart in September, 1915, for the physical treatment of those men whose recovery was delayed by the various disabilities occasioned by the war. These patients are supposed to be such as are capable of being made efficient soldiers within six months. The admissions, however, include many in regard to whom palliative measures only can be adopted, and who, if considered suitable, are transferred to one of the orthopædic centres for special treatment.

Eliminating the procedure followed in those cases of deformities resulting from cicatrices or scar contracting tissues I propose giving an account of the treatment we adopt in the class of injury under discussion. The procedure is inclusive of, and may be usefully considered under, the following: (1) Radiographic information; (2) manipulations under anæsthesia; (3) massage and the special work of that department; (4) special exercises and general gymnastics.

Radiographic Information.

In every case where a lesion involving bones or joints exists, or where there is a suspicion that the function of the part is being interfered with by bony injury, by the presence of metallic fragments, or by other ascertainable cause, a radiograph is taken on admission. It is, however, quite unusual, in our experience, to admit patients who have not been X rayed in other hospitals on one or more occasions.

There are, of course, patients whom it is advisable to have X rayed more than once, and where valuable information may be obtained by so doing.

In one of our cases, a gunshot wound of the left elbow, which was described as being fixed at a right angle, three X rays were taken, one at the beginning, one during, and one at the end of the treatment. In the first the report stated that the joint was disorganised, the olecranon fractured, and much shrapnel dust embedded in it. The outlines of the bones entering into the joint were scarcely discernible. At the earnest request of the patient, the joint was examined, under an anæsthetic, and appreciable movement was obtained. This was maintained and subsequently increased by massage and forced movements, aided by the persistent efforts of the patient himself. In the second the disorganisation was less marked, and the bony outlines were becoming apparent. In the third the outlines were clearly defined, whilst the functions of the joint had been restored, for all practical purposes, and the patient discharged for full duty.

Manipulations under Anæsthesia.

An examination under anæsthesia is undertaken in every suitable case where there is any undue interference with the function of a part or in which some moveable obstruction exists and where the radiograph shows no lesion likely to be aggravated by the examination or by the subsequent manipulations. The anæsthetic generally used is A.C.E., which is given to the point of ensuring complete muscular relaxation. The extent of the disability is determined, the limitation of movement defined; any fibrous adhesions are broken down and any obstruction capable of being rectified is overcome. No undue force is ever used, and in no case has inflammation or notable swelling followed, whilst considerable improvement has, in practically every case, resulted. It may be of interest to note that out of the first 100 cases thus operated on 75 returned to full duty.

Massage is commenced within a few hours of the manipulations, light in character if pain be present, more firmly otherwise. The pain from the breaking down is usually quite transitory and passes off in the course of an hour or so. Massage and radiant heat are continued for a week or ten days, when exercises by weights and pulleys are commenced. During the first week of these exercises massage is still continued, as the muscles are often inclined to be painful from their unaccustomed use.

In certain cases a previous attempt had already been made, and some disturbance caused, in consequence of which the joint had been immediately placed at rest on a splint. The disturbance may possibly have been immediately due to a too early interference, or a too vigorous attempt at movement. Early interference is to be deprecated, where there has been destruction of tissue by gunshot or shell, followed by suppuration. Many of these cases clear up wonderfully by expectant treatment, and it is not until all danger of lighting up any latent mischief has passed and further improvement appears to be at a standstill that forcible manipulation is advisable.

No joint should be forcibly manipulated when a discharging sinus exists in its near proximity. The fact that the joint proposed for *brisement forcé* is some distance from the site of the sinus does not preclude the danger of setting up acute mischief. A case in point is that of a sinus in an upper arm, in which forcible manipulation of the wrist was undertaken some months previous to his admission at Croydon. The history sheet noted the date of the breaking down and a few days later the significant remark that the wrist-joint was opened for metastatic abscess.

In moving joints under anæsthesia the failure to obtain a full range of movement is of small importance, if the limitation is due to contracted muscles or induration round the joint, and undue force should not be exerted for this achievement. After-treatment will usually regain the full movement, if sufficient freedom has been obtained under the anæsthetic to enable the controlling muscles to act on the joint.

The less force it is found necessary to employ the better is the prognosis of a good result. Joints blocked by dense inflammatory products do not respond well to forcible manipulation, but in suitable cases of joint stiffness restoration of function is materially hastened by its employment.

Massage and the Special Work of that Department.

The treatment given in the massage department includes radiant heat, hot-water and contrast baths, the ordinary massage manipulations and movements, besides the faradic, galvanic, and sinusoidal currents, and ionisation. The treatment is given daily, in length varying according to the case, the minimum duration being half an hour.

A certain amount of controversy seems to exist as to whether massage should prove a painful process or not. In the class of cases we have to deal with massage and its attendant movements must cause discomfort and occasionally pain from the nature of the disabilities they have to overcome; so that, in so far as we are concerned, light effleurage alone and the much-admired gentle stroke of massage are merely a waste of time. On the other hand, in the massage of recent fractures, sprains, synovitis, and allied conditions anything in the nature of roughness must be avoided.

Special Exercises and General Gymnastics.

The special exercises supplement the work of the massage department, and are adapted to strengthen still further the weakened muscles and muscle groups, as well as to increase the range of joint movements. The weakened or injured muscle or groups of muscles are encouraged to act, and assisted in the action by the descent of weight, which has been raised by the sound antagonistic muscles. The repetition of this movement at first is strictly limited and the weight a light one, but as progress is made the weight is increased and the exercise lengthened. As further improvement is effected the range of exercises is extended, and becomes inclusive of those in which the weight, light at first and heavier afterwards, is lifted by the affected muscles.

It ought to be mentioned that voluntary exercises performed on a pulley machine are in every way superior to the automatic movements obtained by mechanical machines based on the Zander type. For if a joint is so stiff that it cannot be moved or be encouraged to move voluntarily it is quicker to loosen it once and for all under anæsthesia.

In addition to these various forms of exercise swimming is found to be an agreeable and useful remedy in most cases of crippled limbs, and in the summer a contingent from one or other division attends the baths daily.

As soon as the weakness of the special muscles or muscle groups has been overcome, and in cases where there is no specialised muscular debility the proper use of ordinary gymnastic apparatus proves of material assistance in restoring the general tone of all the muscles and of thus taking part in the restoration of the lost function. Take, for instance, those cases where, after being suppled down by *brisement forcé*, massage or other means from a state of rigidity, the movements of the hand remain slow in execution, with weakly grasp. The man is taught to climb a rope, walk with his hands along parallel bars, and twist the nautical wheel. The effort required to grasp the rope, or bar, with the sound hand instinctively makes the man use the defective hand as well. Similar stimulation is given to the now free but slowly bending knee when the man is taught movements on the spar, plank, ladder, or rib stools.

The playing of games such as the throwing of the medicine ball, a large stuffed ball weighing 7½ lb., also aids in regaining the rapidity of action. It is surprising to notice how quickly men seem to forget the existence of disability in the excitement of games.

The foregoing is but a brief description of physical treatment which we have found of great value in dealing with not only this class of injury but other disabilities as well. The essential conditions for a successful issue are, first, that the early stages be commenced as soon as all wounds are soundly healed; secondly, that the exercises and gymnastics be undertaken by a trained instructor under the supervision of a medical man skilled in such work or, better still, directly under a medical man who himself is a trained gymnast.

Seymour-street, W.

THE WAR NEURASTHENIC.

A NOTE ON METHODS OF REINTEGRATING HIM WITH HIS ENVIRONMENT.

BY A. J. BROCK, M.D. EDIN.,
CAPTAIN, R.A.M.C. (TEMP.)

THE main pathological feature in these patients' condition is their "separatism." They are "up against" everything; they have "no use" for it. Now this separatism or discontinuity needs direct and immediate treatment, and this treatment must obviously be a re-synthesis—a joining-up of the patient again with his "circumstances," his surroundings.

Reintegration with the Social Environment.

It is necessary that the patient should be taught to overcome his unsociability, his tendency to shun the society of his fellow-men; he must come "out of his shell."

This is where an element of home life provides a useful corrective or adjuvant to residence in an institution. At the war hospital for neurasthenic officers where I have been serving as medical officer for the past 16 months we have found that a patient was often improved when his wife, and perhaps child, came and lived in the neighbourhood, and he was allowed to spend part of his day with them. The danger here is that sometimes the officer comes to depend too much on his wife, and fails to cultivate his own will-power, so that when she goes away from the district he is left "at a loose end." The neurasthenic is very apt to use his relatives merely as props or drugs, to pander to his feeling of helplessness; sometimes relations (and, of course, also other friends) become such a nuisance in this way that the patient has to be forcibly isolated from them by interposition of the "Weir-Mitchell treatment." An intelligent wife, however, can often be a great help to her husband, though both should be warned against the risk of giving or receiving undue sympathy.

Beyond one's family group comes the circle of one's neighbours; it is at his peril that the neurasthenic gives these too much of the cold shoulder. It is often good practice for him to make himself go at a certain hour daily into the congregating-room of the officers, and there actually to force himself to enter into friendly conversation with those of his fellow patients who seem most unapproachable. This is often a very hard task, and should be looked upon not necessarily as a pleasure, but primarily as a piece of strenuous moral gymnastic. Letter-writing also commonly presents difficulties; the neurasthenic readily gets out of touch with absent friends and relatives. This weakness needs rectification. He should draw up a list of such friends, and write to one or two of them every day at a fixed hour.

Many of these patients object to having their meals with others; here is an opportunity for their realising the essential and literal meaning of the word *companionship* (a "taking bread with," from *cum* and *panis*); there is no better discipline for a neurasthenic than to have to make himself companionable at table.

For more definitely civic activities an outlet has been provided by the Boys' Training Club, run entirely by officers of the hospital. The work is done in connexion with the Boy Scouts and also with the local school board. Regular classes are carried on daily by officers who have been used to dealing with boys (many were schoolmasters or officers in Boy Scouts' organisations, Boys' Brigades, Church Lads' Brigades, &c., before the war). Among other advantages derived from this work, officers who have become timid about taking parades or giving orders to troops find it a useful half-way stage. The boys are almost always exceptionally keen; they welcome this departure from the routine of their ordinary lessons, and thoroughly appreciate being instructed by "real officers."

Reintegration with the Physical Environment.

Further, the patient has to deal with his non-human, his physical environment, and it is his duty to impress his personality on this also. This is ergotherapy, the occupation-cure *par excellence*.[1] It is important to get every patient as soon as possible (after the acute symptoms have subsided) on to some form of constructive work. If he is entirely the victim of his thoughts and devoid of any power of concentration, it is often useful to begin him with some form of toy, such as the "Meccano" apparatus, or even a jig-saw puzzle, and to proceed upwards from these through fretwork, mat-making, to wood-carving, and so forth. The kind of work which he should eventually aim at must, as far as possible, fulfil two conditions. It must bear relation both to (1) the organism or individual, and (2) his environment. That is to say, it should, in the first place, be work which the patient likes (or which he has liked when well), work for which he has special aptitude and experience; there is no good putting an engineer to farming, or vice-versa. Secondly, the work should, if possible, be of obvious and immediate practical utility; it should have, as one might say, a local or regional sanction. That is to say, here, at least, the principle of "Art for Art's sake" is obviously untenable. At —— War Hospital we have set our farmers both to study in the local College of Agriculture and to work in the fields around the hospital; our gardeners we have set to cultivate their allotments in the hospital garden; motor experts have gone and worked daily at repairing cars in the city garages; lawyers, architects, artists, dentists, &c., have found employment in the schools or offices of their respective crafts in town. In our wood-work shops at the hospital and in the engineering shops of the University and a local secondary school (most kindly put at our disposal by the authorities) a great deal of excellent work has been done.

Recreations have undoubtedly their place in the treatment of neurasthenia; work should only be entered into gradually, with many periods of relaxation. *Dulce est desipere in loco.* Still, recreation should yield step by step to occupation. A patient with farming tastes, for example, will in the long run get more benefit from swinging a scythe than from swinging a golf-club.

One of the occupations which, last summer and autumn, excited the greatest amount of interest and emulation was the building of model yachts and motor-boats; weekly regattas, at which these boats competed, were held on a local pond. I noticed, however, that the interest evoked at first by the building of these models, beautifully finished as many of them were, tended eventually to wane, and the original self-dissatisfaction of some of the builders re-established itself in full force. The reason, doubtless, was that these things were, at best, toys, and fulfilled no useful purpose beyond providing a temporary interest and distraction. Workshops are valuable for teaching one the use of tools, but, this learned, the neurasthenic should as quickly as possible go out with his tools to coöperate with his fellows in the field of life around him.

[1] See Ergotherapy in Neurasthenia, by A. J. Brock, Edin. Med. Journ., May, 1911.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

ACUTE OSTEOMYELITIS OF FEMUR, COMPLICATING AN INFECTED WOUND IN AN ADULT.

BY ARTHUR MORFORD, M.B., B.S., B.SC. LOND., M.R.C.S.,
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THE interest of this case was thought to lie not only in its rarity and in the difficulty found in diagnosing the condition, but also in the complete history of onset and progress, and in the demonstration of the liability to infection of the neighbouring joint in an adult, owing to the absence of the epiphyseal line.

Corporal ——, aged 33, admitted to Metropolitan Hospital with wound in web of right thumb. He had injured the part with a spike, and sepsis followed. Incision and removal of a slough were done in France, 10 days before admission. The man looked healthy, temperature and pulse normal, and complained of no pain. The wound healed in a week.

Patient then complained for first time of persistent pain in right knee, which he said he had felt for a week. He could not remember having injured the part. Examination of joint negative, except for some tenderness on the inner side, and slight soft crepitus present in both knees on movement. A skiagram taken two days later revealed nothing abnormal. Meanwhile patient walked out. A week later his temperature rose slightly and he took to his bed. The temperature continued to rise, until on the fifth day of pyrexia it reached 104° F.

Evident swelling of right knee-joint, which felt hot and was tender; movement caused great pain.

On the ground of a tentative diagnosis of rheumatic fever, 2 drachms daily of sodium salicylate were then given and continued for a week. Next day the temperature fell to 99°, and for three days remained between 97° and 100°, after which time it rose rapidly to a maximum of 103°. The day after administration of salicylates was begun pain in knee was worse, in spite of fall in temperature. Patient was evidently very ill, with dry foul tongue and hoarse voice, profuse sweating, and headache; he complained of urgency of micturition; passing large quantities of highly coloured urine, otherwise natural. Examination for urethral discharge negative. Knee hot and swollen, especially on lateral aspects; skin over it red, and showed several small bullæ, thought due to use of iodine as counter-irritant. Examination of heart and lungs revealed no abnormality. No other joints became infected, and it was felt that the original diagnosis of rheumatic fever should be revised.

The patient's general condition remained much the same for four days, when definite œdema and brawny induration appeared at the knee and rapidly spread half-way up inner aspect of thigh. The bullæ previously observed had become large and sloughy ulcers. Though the joint was kept flexed and immobile, there was no œdema or other evidence of inflammation anteriorly. Percussion over patella and great trochanter was painless, but over condyles of femur caused severe pain. Slight enlargement of femoral lymph glands, but they were not tender.

At this stage operation was undertaken, and through short internal incision an enormous collection of pus was evacuated from thigh. Femur felt in middle of cavity, smooth and bare. Through a long external incision the shaft of the bone was explored and found entirely bare of periosteum and muscular attachments, including popliteal surface and linea aspera for about half its length. The medullary cavity, opened by a long chisel cut, contained blackened débris and did not bleed.

After operation the patient's condition improved considerably, but within a week evidence of infection of knee-joint appeared. Aspiration produced blood stained fluid which yielded a pure growth of a white staphylococcus. The joint was then opened by incisions on either side of patella, and was found full of a non adherent coagulum which was easily expressed. Synovial membrane of deep red colour; cartilage only slightly eroded in places. Along the depth of each incision a Carrel tube was laid, and two-hourly irrigations carried out. Within 10 days the knee had nearly healed, but the suppuration spread farther up the thigh. The external incision was lengthened and medullary cavity of femur opened up to within 3 inches of great trochanter. Throughout its length the bone contained dense, yellow, jelly-like matter. The patient at this stage was very ill; amputation had to be rejected on account of his condition. However, he improved, but a week later a fluctuating swelling behind great trochanter had to be incised, and medullary cavity was opened as far as neck of femur. It contained the same thick pus. Fortunately, at this stage, the progress of the infection seemed stopped; no signs of active suppuration in hip-joint appeared.

The patient's condition slowly improved, and within a month his evening temperature became normal, though his pulse-rate remained rapid. The wound rapidly granulated under flavine treatment, until only two deep sinuses remained. Immobilisation of the limb was effected by extension on a modification of Liston's long splint, by which nursing and dressing were greatly facilitated. Recent skiagrams show a commencing formation of involucrum.

I am indebted to Mr. R. A. Ramsay, surgeon to the hospital, for permission to publish this case.

TWO UNCOMMON FORMS OF INTUSSUSCEPTION OCCURRING SIMULTANEOUSLY IN THE SAME PATIENT.

BY JOHN A. C. MACEWEN, M.B., C.M. GLASG.,

ACTING SURGEON, GLASGOW ROYAL INFIRMARY; VISITING SURGEON, GLASGOW DISTRICT HOSPITALS; HON. SURGEON, H.R.H. PRINCESS LOUISE HOSPITAL FOR THE LIMBLESS, ERSKINE; CAPTAIN, R.A.M.C. T.; ETC.

THE patient, a male child of 18 months, was admitted to the wards under my care in the Royal Infirmary, Glasgow, on Oct. 9th, 1917, with a history of persistent vomiting for three days prior to admission, and the passing of mucus, blood, and slime by the bowel, but no fæcal matter. He was obviously very ill, was collapsed, and his general condition was poor. Immediate operation was performed, the abdomen being opened in the middle line, when a short intussusception of the small intestine about the upper end of the ileum was found. This appeared to be recent, and was quite easily reduced. It involved about six inches of bowel in all. As this intussusception did not appear to explain the severity of the illness and the distension of the bowel below the obstruction, a further search was made and a second intussusception was found at the splenic flexure, the transverse colon being projected into the descending colon for about 3 inches. This intussusception appeared to be less recent, and was much more difficult to reduce. No exciting cause was found. The abdomen was stitched up and the child returned to bed. While he recovered from the intussusceptions and operation, he developed a subacute pneumonia and died 25 days after the operation.

Glasgow.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF NEUROLOGY.

Cinematograph Demonstration of War Neuroses.—Essentials of Treatment of Soldiers and Discharged Soldiers Suffering from Functional Nervous Disorders.

A MEETING of this section was held on March 12th, Dr. R. PERCY SMITH, the President, being in the chair.

Major A. F. HURST, R.A.M.C., gave a demonstration of War Neuroses. The series of films shown were taken during the last nine months at Royal Victoria Hospital, Netley, under the auspices of the Medical Research Committee in order that a permanent record of some of the remarkable neuroses which had developed in soldiers should be obtained to form a part of the medical history of the war. At the same time they illustrated the developments in the methods of treatment pursued. A year ago the workers were satisfied if they taught a man admitted for paraplegia, which had already persisted for several months, to get about within a day or two of admission, but they realised that he would require several weeks of further treatment by re-education before he could walk normally. Increased experience had given them greater confidence, and they were now disappointed if they did not cure all cases of hysterical paralysis, contracture, speech defects—such as mutism, aphonia, and even stammering—and the tremors and tics, which were formerly regarded as incapable of rapid recovery, within 20 hours of admission, however long the symptoms persisted before the man reached Netley. This was demonstrated in the slow but steady progress shown by the cinematograph of the early cases contrasted with the more recent films, which afforded actual records of complete recovery in the course of an hour of a hysterical paraplegia which had lasted for several months. The one essential for success in dealing with hysterical cases was complete mutual confidence of patient and medical officer. From the moment the former entered the hospital he was made to realise that he would quickly get well. Hypnotism was no longer used and very rarely such adjuncts of suggestion as electricity or etherisation, but they contented themselves with vigorous persuasion and manipulation, being convinced that it was greatly to the patient's advantage to feel that he had taken an intelligent part in his own cure, and that there was nothing mysterious about the proceedings. These men should be admitted direct from France into special hospitals, situated in the country, with special medical officers who knew how to create a true atmosphere of cure. Here, along with the neurasthenics and psychasthenics, they would quickly recover by being given, when convalescent, healthy and interesting outdoor employment instead of lounging about the wards and corridors of large general hospitals with no opportunity for taking exercise except in the streets. Most would eventually return to military duty, whilst the remainder would be discharged from the service after a few weeks or months, but never before they had recovered sufficiently to earn a living in some civil occupation of national importance.

Dr. E. G. FEARNSIDES read a paper on the Essentials of Treatment of Soldiers and Discharged Soldiers suffering from Functional Nervous Disorders. He said that before any soldier or discharged soldier could be treated for his functional nervous disorder his case must first be diagnosed. Many soldiers in the various general hospitals who were suffering from this complaint were wrongly diagnosed. There was no single system which might not be affected by a functional nervous disorder, the common mistakes being those in which the diagnosis referred to muscles, nerves, joints, and the extremities, such as "myalgia," "rheumatism," "lumbago," "sciatica," "neuritis," "rheumatoid or osteo-arthritis," "trench feet," "frost-bite," &c. In many cases diagnoses of various affections of the alimentary tract or pulmonary system were but too frequently attached to patients whose real trouble was of psychical origin. The majority of patients diagnosed as suffering from "D.A.H." would be benefited by special treatment directed to the psycho-neurological aspect of their disabilities. Cases in

which diagnosis was made of organic diseases of the central or peripheral nervous system were much less frequent. The causes of these mistakes were two: (1) the fact that in our medical education too little stress had been laid on the mental condition of our patients and too much upon the physical; and (2) the amount of trouble entailed before the diagnosis in the case of military patients might be altered. The diagnosis of functional nervous disorder having been made, where ought the patient to be treated? All those who had concerned themselves with the treatment of these men were agreed that special hospitals were a *sine qua non*. Schemes for the distribution of soldiers or pensioners in houses with isolated families up and down the country, even from a purely administrative point of view, were impossible, and owing to the size of the problem could never be dealt with adequately. In such houses, moreover, there was no atmosphere of cure, and but rarely would the *milieu* be satisfactory. The majority of the world did not feel drawn to the nervously disposed, the emotional, or the self-centred. Special hospitals, therefore, were essential. Under military conditions a man must be either doing military work of some kind or be in hospital. Yet no person who had broken down with a functional nervous disorder was fit on the day he left secluded ward life for meeting the difficulties of the everyday life of the soldier in the New Army. The hospitals, therefore, must have attached to them grounds of sufficient size for the treatment of patients in the stages between hospital and duty. These patients, in many cases, showed evidence of disease or disorder of other portions of the body, and for this reason the hospital should be situated not too far from experts in other classes of disease and injury, and should lie not too far distant from a general military or large civil hospital. In the case of military hospitals these should be near a railway station or there would be difficulties in transport and conveyance both for patients and consulting staff. There were two great groups of these cases: (1) the passive suggestible *hysteric*, who had shrunk into himself and developed fixed, circumscribed, obvious objective difficulties, and was usually best dealt with by a *force majeure*, sent in as a stimulus from the external environment; and (2) the restless, discontented, hypersensitive, more delicately poised psycho-neurasthenic, with his much less easily comprehended subjective worries, fears, and bothers, ego-centric and yet expansive when approached sympathetically, who, if treated in the coarse manner so adequate in the case of the hysteric, would not only not be cured, but would be rendered well-nigh incurable. The treatment of each patient must be individual and personal, the medical officer acting as doctor, guide, friend, counsellor, and leader. The casual visit of a consulting neurologist or officer in charge of a hospital was worse than useless, undermining the authority of the patients' medical adviser, diminishing the patients' reliance and confidence in him, and throwing the responsibility for treatment on to his more senior colleague. The results of treatment depended, above all, on the personal equation of the medical officer in charge much more than upon the exact methods of treatment relied upon. The medical officer should, therefore, live with and develop an interest in the particular problems by which each individual patient was dominated Much depended upon the atmosphere with which a patient was surrounded. Occupation of a useful kind was essential, such as needlework, mat-making, and wood-carving, for bed patients; and for those who were allowed to get up and go about, training in some occupation likely to be of use to the patient in after-life had provided the most stable recoveries. Instruction in workshops was a necessary part of treatment in those who were not returning to the fighting ranks of the Army; and for those whose civil and military work would in the future be out-of-doors, work on the land, such as gardening, farming, &c., should be provided. Entertainments of some sort, and especially those with a competitive aspect in which the patients themselves took part, generally increased the rate of recovery. Physical drill and gymnastic displays were extremely useful. Much depended upon the training and previous experience of the medical officer. He must know his patient, and in consequence of the necessity for personal attention on the part of the treating doctor too many patients upon his hands would make his results poor. In general 50 patients would be a maximum. As a mode of treatment modified psychanalysis was essential. Dreams might be useful in diagnosis and in helping to elucidate the divers problems of psychological origin with which the patient was faced. In the hands of some hypnotism and hypnotic suggestion had been successful. Suggestion of some sort was essential, whether used through strong faradism, by personal contact or during hypnosis. Massage, electricity (high-frequency, faradism, static breeze, &c.), baths (sinusoidal, eau courante, hot and cold douches, &c.), radiant heat, and remedial exercises, gymnastic exercises, and physical training were useful but secondary adjuncts. Workshops were essential, especially those given over to woodwork and carpentry. He would suggest that it be recommended to the military authorities that around such special hospitals separating depôts for the A.O.D., the A.S.C., the A.S.C.M.T., and R.E.'s should be established. By such a means the working capacity of men under treatment in special hospitals might be put to immediate, useful, national military work, and at the same time such depôts would be a means of training soldiers suffering from functional nervous disorders before transference to these specialist branches of the Army. Dr. Fearnsides gave the following analysis of results of treatment at the Home of Recovery, Golders Green, for the five months between Oct. 1st, 1317, and Feb. 28th, 1918. The number of discharges was 185.

Results of Treatment at Home of Recovery, Golders Green.

	Number of discharges in—					
	October.	November.	December.	January.	February.	Total.
Patients medically unsuitable for Golders Green	5	2	3	9	5	24
Patients who resented treatment	7	1	3	1	—	12
Left for good family reasons ...	—	1	1	—	—	2
Disciplinary discharges	—	2	1	1	—	4
—	12	6	8	11	5	42
Practically attained pre-war standard...	—	4	—	—	—	4
Fit for work	17	9	3	10	—	39
Returned to former employment with letters, &c.	15	9	10	12	6	52
Went to new work	3	9	6	5	6	34
Went to further training	—	1	2	6	5	14
—	40	32	21	33	17	143

Captain E. D. ADRIAN, R.A.M.C., said that when considering treatment the psycho-neurasthenic must be considered as a type apart from the hysteric, and asked Major Hurst what his experience in treating this class of case had been. Of 1000 patients who had passed through his hands at Aldershot 70 per cent. had been psycho-neurasthenics. These men as a class were far more difficult to treat, and for them treatment had to be more protracted.—Sir ROBERT ARMSTRONG-JONES asked whether it was not better for the ex-soldier that an institution dealing with a large number of cases should be managed by a layman rather than by a medical man.—Dr. H. HEAD emphasised the unanimity of aim amongst trained neurologists. What was needed was real examination, intelligent diagnosis, and reasonable treatment.—Sir JAMES KINGSTON FOWLER said that the principle of treatment was the domination of a strong mind over a weak one.—Dr. T. A. ROSS asked Major Hurst what percentage of his patients returned to full military duty and whether any felt themselves worse after their hysterical disabilities had been removed, as in his experience such a removal often rendered patients extremely wretched and mentally worried.—Dr. J. CHARLTON BRISCOE said that there was no use in discharging men from military service unless after discharge they were followed up, looked after, and given an inducement to work. At the time of their discharge from Golders Green most of the men were not fit for full employment and still showed a certain degree of incapacity, but many of them had been interested in the employments offered there and had applied for further training in carpentry, engineering, &c., in which they had received instruction whilst undergoing treatment. Directly a man left institutional life he should go back to active employment and should never be allowed to stop at home doing nothing. Some scheme to ensure this happening in the case of every

single individual patient was necessary.—Major HURST, in reply, said that under favourable conditions about 50 per cent. of the patients could return to military duty; at the time of discharge the other half were fit to earn their living in ordinary civil life. There was a great need for some scheme by which patients could be given work directly they left hospital. Of the types which he had seen at Netley the hysterics were the easier to treat. These formed about the same proportion as at Aldershot. The effects of treatment in the neurasthenic type could not, of course, be recorded photographically. More medical officers were required and kindness and sympathy were needed. The medical officer must be the patient's friend. Some means should be devised by which the patients, before appearing at their medical boards, were not subjected to long and tiring journeys or they would then seem much more incapacitated for work than they really were. It was desirable that the medical officer who had treated a patient should be a member of any board which was appointed to estimate incapacity.

Reviews and Notices of Books.

Scopolamine-Morphine Semi-Narcosis during Labour. By W. OSBORNE GREENWOOD, M.D., B.S. London: Oxford University Press. 1918. Pp. 120. Price 6*s.* net.

THE pain and anxiety attendant upon child-bearing in the human species can hardly be a recent product of civilisation due, as some appear to think, to an increasing sensitiveness to painful stimuli or to a less stable central nervous system, for in various records of primitive peoples the evil was recognised as one of such magnitude as to imply a retribution for wrong-doing, a doctrine which has its best-known expression in the Hebrew sacred writings. More than a trace of this feeling survived at the time when Simpson proposed to abolish altogether the pain of parturition by means of the newly discovered action of chloroform, and is even a complicating factor in the discussion now centring round the employment of the scopolamine-morphine method which purposes to abolish the memory of the birth-pains. It is natural, too, and perhaps inevitable, that where the condition demanding relief is one of everyday occurrence those who have obtained relief should publish their personal experience and generalise widely from it, instead of waiting for the accumulation of a body of exact medical observation to serve as a control. The literature of twilight sleep—the popular name is a good one in not committing to any theory of its action—abounds in isolated records of unlimited success, with portraits of smiling and distinguished expectant mothers who have travelled thousands of miles to the twilight Mecca and returned with chubby babies and the memory of a heroic and painless adventure. There are also records of widely discordant results obtained in various countries by distinguished obstetricians who, holding strong views themselves, have impressed them upon their assistants and have thus established opposing schools of thought. A third class of literature has been a general survey of the whole subject by authors, without large personal experience of the method, who base their conclusions on argument from analogy and the published records of others. These writings have their value, but none of them can take the place of such a record as that of Dr. Greenwood, who bases his monograph on two sources: (1) a survey of the literature, and (2) a series of 200 cases—138 in primiparæ and 62 in multiparæ—treated by himself over a period of two and a half years.

Dr. Greenwood begins with the history of twilight sleep and the chemistry and physiological action of the drugs used to produce it, following with a chapter on the objects of treatment. These parts of the book are well done and should be read as a whole, but the reader who has any previous knowledge of the subject will pass on at once to two burning topics—namely, technique and the effects on the infant. Dr. Greenwood discards the tenets of the "one-dose" and the "standardised-dosage" schools and adheres to the "individualisation" school, in which the effect of one dose is taken as the guide to the next. His initial dose is morphine gr. 1/4 plus scopolamine gr. 1/100 (or morphine gr. 1/6 in women of smaller general build), the morphine only being given once and the scopolamine repeated at intervals of one-half to four hours after determining by specific interrogation that amnesia is passing off. In his series he records three total failures to achieve amnesia, one at least of which he considers was due to insufficient care in interrogation of the patient. Dr. Greenwood's directions as to this interrogation are precise and can easily be followed by others. His success in obtaining the result aimed at is certainly striking.

In regard to the effect on the infant Dr. Greenwood considers that asphyxia is an avoidable complication not inherent in the method. For the oligopnœa, which is the chief objection urged against twilight sleep, he holds the morphine alone responsible, and since abandoning the administration of a second dose of morphine he has only had three slight cases, in none of which the oligopnœa was alarming. In his own cases, although prepared to resort to artificial respiration, he actually employed it on three occasions only, in which some complication (difficult extraction, cord around the neck, premature detachment of placenta) rendered it necessary. Again, in Dr. Greenwood's hands the danger to the infant does not appear to have exceeded that of labour under other conditions.

A series of charts is appended to the book, giving the exact dosage in each case and the indications on which this dosage was based. A comparison of first and last charts serves to illustrate the development of the author's method as a result of experience.

All who desire to give the scopolamine-morphine method a trial should read Dr. Greenwood's book, and those who have already made up their minds either for or against the method will also find food for reflection in his experience.

Reliquiæ: Verse Compositions. By JAMES PEDDIE STEELE, M.D. Edin., LL.D. St. And. Edinburgh: H. J. Pillans and Wilson. 1918. Pp. 76.

Dr. James Peddie Steele was known to many of our readers to possess in high perfection the elegant gift of writing Latin verse, and some of his metrical exercises appeared in these columns. The greater part of his professional life was spent in Rome, from which city, and later from Florence, for a space of over 40 years he wrote monthly letters to THE LANCET. During all this period his special recreation was the composition of Latin verse, and he was often urged to publish his work in book form by those who knew the high merit of its execution. But Steele's standard for such work was so high, and his modesty so real, that he never could bring himself to the point of publication, though it was known that he intended at some time to face the ordeal When he died suddenly some nine months ago his work was still uncollected and partly in manuscript. Now Professor John Harrower, professor of Greek in the University of Aberdeen, has written a preface to a selection of the verses which has made its appearance to the great pleasure of Steele's personal friends and, no doubt, to that of many elegant scholars. The Ode to Guido Baccelli, which we published on the occasion of his presidency of the International Congress of Medicine in Rome in 1894, is a remarkable imitation of Horatian Alcaics, the argument covering the same vast ground as that covered by many of the odes of Horace. For the tribute to Baccelli as citizen, as Minister of Public Instruction, and as Italy's leading consultant physician, is neatly preluded by allusions to the Roman victories over the Gauls and Hannibal and the Risorgimento of the Kingdom of United Italy under the House of Savoy. The short copy of Elegiacs testifying to the merits of James Goodchild Wakley, the Editor of THE LANCET with whom Steele mainly worked, forms another example of the writer's finished Latinity, and was also written from the heart, for the two men, opposed in every conceivable way both in nature and accomplishment, were very sincere friends.

The Theory and Use of Indicators By E. B. R. PRIDEAUX, M.A., D.Sc. London: Constable and Co., Limited. 1917. Pp. 375. Price 12*s.* 6*d.* net.

THE subject matter of this interesting volume is well summed up in the first sentences of the opening chapter. "In its broadest sense the chemical indicator may be defined as a substance which when added in small quantities shows the appearance or disappearance of a chemical individual (ion or molecule) by a conspicuous change of colour. In this volume only those indicators will be described which show

the presence of hydrion or hydroxylion (H· or OH′); in other words, the indicators of acidimetry and alkalimetry." Then follows the mathematical treatment of the subject, which sheds a light on practical considerations, the whole forming a very interesting study. The subject has developed on scientific lines only in recent years, considerable impetus being given to its successful investigation by the application of the theory of dissociation. We have advanced a long way since the Romans found that the hardness of water could be relatively determined by its bleaching effect upon small quantities of red wine (Hippocrates). The author appears to have been successful in collecting the available material on the subject, and the chapters all the way are distinctly illuminating, and theoretical considerations are followed by valuable practical issues. The mathematical development of the subject will no doubt mystify some readers, but the whole work shows a fruitful study of the interesting and practically important phenomena of colour indicators.

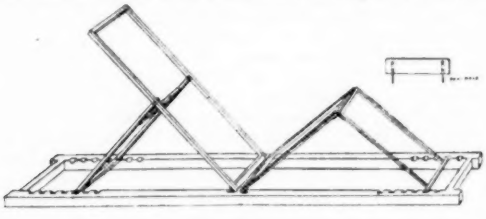
Field Sanitation. By C. G. MOOR, M.A., F.I.C., F.C.S., and E. A. COOPER, D.Sc. London: Baillière, Tindall, and Cox. 1918. Pp. 230. Price 2*s.* 6*d.* net.

THIS is essentially a practical account of sanitation in its several branches as at present applied in the field. The authors, both captains of the 1st London Sanitary Company, R.A.M.C. (T.), have secured the collaboration of other officers and men of the same company. The result is a collection of simple instructions on routine sanitary work adapted to modern war conditions. The book will be valued as presenting a synopsis of the sanitary operations which experience has shown are practicable and effective in the present campaign. On the whole, the measures enjoined are simple and such as any intelligent combatant officer can carry out. They refer to well-known topics, as examples of which may be quoted the extermination of flies and other insect pests, the disposal of refuse, the construction of latrines, the disposal of fæces and urine, baths and laundries, disinfection, water-supply, ventilation, food, and so forth. As a useful conspectus of modern military hygiene the book may be commended. It is quite up to date, and a decidedly valuable feature of the work is the attention that is drawn to the use of simple appliances in a sanitary direction, as, for example, the employment of boxes and drums, which have been pressed into service for conveying various commodities.

New Inventions.

FRAME FOR PATIENTS IN SEMI-RECUMBENT POSITION.

THE desirability of treating patients with wounds of the abdomen or chest in a semi-recumbent position has long been recognised. To overcome difficulties I had made for me by the carpenter of the clearing station a number of wooden frames similar in principle, I understand, if not in detail, to the "Gotch" frame. The accompanying rough sketch illustrates the idea better than description. The foot-



board is held at right angles to the leg-frame by iron dowels, which fit into holes bored in the side-pieces of the leg-frame. This gives a slight amount of adjustment for patients of different heights. The materials are seasoned hard-wood and stout canvas, which is stretched tightly across the frames before they are assembled.

The bed is made up in the usual way with the frame flat. On the patient's returning from the operating theatre he is placed upon the flat bed until the semi-recumbent position can be assumed. When the bed-pan is in use the thigh and leg portions are lowered.

The patients are very much more comfortable on these frames than on the ordinary back-rest and bolster under the thighs. The required position is maintained with no discomfort to the patient and very much less trouble to the nursing staff. The frames proved, in particular, to be of help in the after-treatment of a large number of abdominal cases treated in the clearing station during last summer's offensive.

L. BRUCE ROBERTSON,
Major, C.A.M.C., —— Canadian Casualty Clearing Station, B.E.F.

REVERDIN'S NEEDLE-HOLDER AND NEEDLES:

A NEW PATTERN FOR EASY USE IN GENERAL SURGERY.

Mr. Victor Bonney, in his article "On the Sole Use of Reverdin's Needle" in THE LANCET of June 30th, 1917, described very lucidly the use of Reverdin's needle. To overcome certain disadvantages possessed by the instrument I have designed a new pattern in which the needle is kept in its place by a lever (Fig. 1, B), simple pressure at once effecting its release from the holder when another needle can be rapidly and easily substituted. At the end of the lever there is a locking bolt (Fig. 1, C), which, when in position, prevents unintentional release of the needle. The needles are made in three different sizes, with a curve suited for general use. The largest, shown in its full size in Fig. 2 (2), is intended for piercing thick or hard tissues—e.g., the cervix. The medium, shown in Fig. 2 (3), is specially adapted for softer tissues—e.g., the abdominal parietes. The finest, shown in Fig 2 (1), is specially suited for more delicate structures—e.g., the intestines, peritoneum, or small nerves. A fourth needle, Fig. 2 (4), is made with a blunt end, and is adapted for aneurysm and hernia operations. A further improvement will be found in having the eye of the needle on the inner side, instead of, as formerly, on the outer side. The release lever, by a simple

FIG. 1.

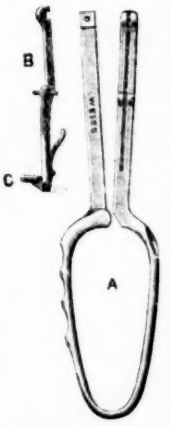
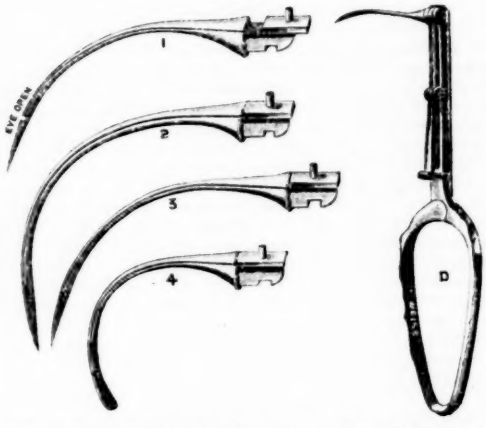


FIG. 2.



device, can be readily detached from the holder for the purpose of cleaning; the lever, the holder, and the needle should be sterilised by boiling.

The instrument has been made for me by Messrs. Weiss and Sons, Oxford-street, London, W.

ARTHUR WAI-TAK WOO, M.B., B.S.Lond.,
Hon. Captain, C.A.M.S; late Obstetric and Gynæcological Tutor and Registrar, Middlesex Hospital.

AT the last meeting of the Devon Insurance Committee it was stated that further sums of money would be allocated to the medical men in respect of mileage in consideration of the increased difficulties and expense of travelling in the rural districts.

THE LANCET.

LONDON: SATURDAY, MARCH 23, 1918.

Medical Coöperation and Medical Interests.

IF medical science is to play a large part in the social reconstruction of the nation in the near future—and there is little doubt that it will have the opportunity as well as the desire to do so—it is high time to determine what that part is to be. The letter which we publish this week over the names of leading members of the teaching and medical professions in a great North-country city suggests a common effort by the two professions to pledge the country now to far-reaching schemes of reconstruction. We have already indicated[1] that the coöperation and sympathy of Labour might be expected in such a programme of progress and reform, but that comradeship between medical men and Labour must not supplant the comradeship of medical men as a body. In short the ideal medical senator, without representing medicine only, should be an interpreter of medical thought and ideals to his fellow legislators. The newly enfranchised women of the better educated class are keenly interested in many of the social questions with which medical men are concerned, and their influence with the ballot-box should prove of value to medicine, both on its scientific and on its administrative and therapeutic sides. For example, the matter of medical attendance upon the wives and dependents of the working classes is one which might well have come to the front if working men alone were in a position to place it there, but with women also on the register it is sure not to be kept in the background. We single out the question of medical attendance, not because we regard it as more important than better housing, or improvement of the conditions of labour, but because it is one affecting members of the medical profession in their individual practices more directly than the others, and also because it has a strong individual interest for a very large section of the electing public. If the direction of public opinion is found to bring rapidly nearer the giving to all dependents of insured persons medical attendance upon lines resembling those which the insured themselves enjoy—in other words, if it is sought to make the panel doctor of the father the family doctor of his wife and children—a number of questions will arise immediately of direct or indirect interest to a larger circle of practitioners than those now on the panels. All medical practice will be affected, and it seems to us that women voters may appreciate quickly the directions in which this will occur.

Medicine sees fully the advantage to the children of having their ailments brought at early stages to medical men for diagnosis and treatment; but the practitioner will also see before himself and a large number of his colleagues the certainty of a loss of patients from private practice. This loss will be combined with the prospect of children requiring medical attendance far more frequently than they have before, and questions as to the amount of remuneration due for increased work and the source of such remuneration will be made subjects of discussion. The Ministry of Health which lies on the immediate political horizon, when its constitution is settled and its activities defined, may be expected to deal with such matters authoritatively, but while matters are in a state of flux the attitude of the medical profession is dictated by two unchanging aims: whole-hearted support of all measures conducing to the health of the community, and the securing of a proper status for the medical man in carrying out this work. A case in point is the Maternity and Child Welfare Bill now before Parliament, in which the establishment by a local authority of a general domiciliary service by medical practitioners is expressly excluded. In connexion with these and with a variety of other topics the medical man will find himself advising as an expert, making his influence felt as an advocate when Parliamentary elections are drawing near, and himself voting for the candidate whom he may decide so to assist. It will be his duty when the occasion arises to support, in whatever capacity he may be able to do so, men or measures for whom his support is desirable in the public interest, and it will equally be his duty to protect his profession and himself from exploitation, and to procure and promote suitable recognition for the services of medicine. His position in this last respect will not be different from that of the working man or of the brewer or the merchant, who neither neglect the interests of themselves and their fellows, nor are expected to do so.

How far the medical practitioner of the future, whether as a candidate for the House of Commons, or as a canvasser or voter, will have to "mix himself up with politics" is a question which the future must, to some extent, be left to decide; but the attitude of standing aloof from social questions, when or because they have acquired a political aspect, must be dropped by all the citizens of the future. The medical man's part will be to place his science at the disposal of the public, and justify that science by precept and example. As candidate for Parliamentary election and Member of the House the medical man will more necessarily have to study such questions, but his views will require the endorsement of his professional colleagues if they are to be of weight; and this whether politics are carried on upon the old party lines, or whether, as some believe, party obligations become in future less strict, and measures gain support upon their merits at the hands of men selected to exercise independent judgments. In any case, the medical man who enters Parliament will not be able to do so as a "Member for medicine"; he will have to appeal to constituents as a man of affairs who will serve their interests and that of his country with full qualifications to do so. He will have also to be

[1] THE LANCET, Jan. 5th, 1918, p. 27.

one who, while he has gained in his profession sufficient experience to warrant him in claiming to represent it when the occasion arises, is at the same time in a position to abandon it temporarily or entirely for a new career. In such circumstances the ideal medical candidate for Parliament is not likely to be found in large numbers or in many constituencies. When he is found, however, and is willing to allow himself to be put forward, he should secure the support of his medical colleagues where they can conscientiously give it. We may go so far as to suggest that such support should be given even where differences of opinion upon strictly political subjects exist between them. And we would add that a medical practitioner, equipped by his training and experience of life to exercise judgment in many subjects outside the range of his profession, broad-minded and independent, will be more likely to serve his country usefully in Parliament than the majority of those who compete with him for the honour of doing so. He will be a professional man, it is true, but, as we have suggested above, sometimes at least he will have ceased to exercise his profession, and in any case his opportunities for personal advancement either through the casting of a vote or through service rendered to a political party will be few and far between.

The Report of the Radium Institute: the Clinical Value of Radium.

THERE are many morbid conditions for the treatment of which we are always seeking some more thorough or more convenient method, and though we often look in vain, every now and then we find a technique, a procedure, it may be a drug, which proves to be of real value as a therapeutic agent. It is true that by no means rarely the early promises of a decided advance are not borne out by later knowledge, but this is only to be expected, and it should not make us hesitate to seek out every remedy which offers promise of aid. Only by trial can experience be arrived at and codified for general instruction. Although several years have now elapsed since the first introduction of radium as a therapeutic agent, yet its exact position in the treatment of disease still remains to be settled, largely because, it would seem, the trials made with it have not been conducted upon analogous cases, and the results have not been subjected to proper control. Radium has been employed for many ailments, but it is in the treatment of our most obstinate foe—that is, cancer—that its help is most urgently needed, while there is no exact definition of what cancer is. Surgery speaks with no uncertain voice on the treatment of early operable cancer; it cannot be doubted that here wide excision affords a chance of removal of the danger, but it is essential that surgical treatment should be complete, and it must be early, otherwise the disease will quickly pass beyond the reach of the scalpel. In neglected malignant disease there always comes a time when excision is impossible, and the surgeon is powerless. Then comes the need for some form of treatment which can deal with the cases that the surgeon is compelled to decline, and of all recently introduced therapeutic agents there is none surpassing radium in value within its sphere of activity, as at present known to us. To a certain extent the X rays can influence favourably the progress of a malignant growth, but the range of action is small compared with that of radium. How valuable that range may be is well shown in the address which we publish this week by Sir JOHN PHILLIPS on the therapeutic influence of X rays on female pelvic disease, but the value of X rays in malignant disease remains uncertain. Radium, however, appears to have a very definite action on many forms of malignant growth. Considerations of the cost of the material must influence the measure of its use, yet the evidence we possess shows that the action of radium can be counted on, in which case its cost is insignificant in comparison with its value.

The latest evidence that has been brought forward of that value is contained in the report of the Radium Institute just issued. In this document the director, Captain HAYWARD PINCH, recounts what the Institute has done over many years of working, tabulates the results that have been obtained, and tells us what he considers radium can do. This report differs in character from those published in previous years in so far as special prominence is accorded to the after-history of cases examined and treated at the Institute between August, 1911, and December, 1914. But the statistical tables concern only the new cases seen at the Institute during the year 1917. Of all the forms of malignant disease the least obviously malignant is rodent ulcer, a condition well defined by its pathological histology, but not rarely confused in some countries with ordinary squamous-celled carcinoma of the skin. Rodent ulcer is amenable to many methods of treatment: the X rays, carbonic acid snow, ionisation, and excision can all remove it, though with every one of them the risk of a recurrence remains great. Indeed, there would be little or no need to invoke the aid of radium for the treatment of a disease so amenable in ordinary circumstances, but that the disease has this great tendency to recurrence: therefore, if we can find a method of treatment which materially lessens the chance of recurrence it should be used. Now, the evidence produced by Captain PINCH is in accordance with the opinions formed by all who have had experience of the use of radium in cases of rodent ulcer—viz., that the disease can be removed by radium with certainty, and that if a sufficient dose be administered recurrence does not take place. The value of radium for rodent ulcer is thoroughly established by the results obtained at the Radium Institute. With the more malignant forms of cancer the results of the use of radium are not so certain; improvement is common, but a cure is rare. Whether affecting the skin or a mucous membrane, epithelioma has shown a noticeable improvement in almost every case under treatment in the Institute; in many the local lesion disappeared, and no recurrence occurred for many months or even for years; but in others,

although the local lesion was apparently cured, the disease manifested itself in the neighbouring lymphatic glands. Even when the disease is not entirely removed some of the complications may show very distinct benefit from the action of radium. When after carcinoma of the breast there is evidence of lymphatic obstruction in the arm, the swelling of the arm and hand is often considerably relieved by radium, if the treatment is employed before the engorgement has lasted long. Among the other conditions which have shown improvement after exposure to radium when administered at the Institute may be mentioned lymphadenoma. Many cases of sarcoma show themselves remarkably amenable to the treatment, but other conditions, such as those of lupus erythematosus, only occasionally exhibit slight improvement. The use of radium in the treatment of scars is set out very convincingly in THE LANCET this week by Captain W. C. STEVENSON, whose experiences coincide with those of the Institute in regard to keloid. The whole record of the work under the superintendence of Captain HAYWARD PINCH goes to show that with intelligent application we have in radium a valuable therapeutic agent, while much of the results suggests that further experience in its employment will expand its utility.

One important question remains to be considered, how does radium act? There have been many suggestions as to its mode of action, but only one fact seems to have been really ascertained. The action seems essentially to be the same as the action of X rays. Both these forms of radiant energy appear to have a destructive influence on all forms of living tissue, but this influence is decidedly greater and more readily manifested on abnormal cells than on the healthy tissues of the body. The cells become granular and break up; sometimes vacuoles appear in them; absorption of the débris occurs, and for a time a shrunken cell membrane is all that remains of the erstwhile malignant cells; then appears new fibrous tissue, the amount varying widely in different cases, and thus, if success is following the treatment, the malignant mass is replaced by a fibrous nodule, while in some cases no trace may be left of the former disease. The deeper the disease, the greater the obstruction offered to the rays, and the less the effect of the treatment. An increase in the amount of radium employed will to a certain extent compensate for the increase in depth, but there is a limit to this; so that it is not possible to follow malignant disease which has penetrated far into the tissues, or to deal with secondary growths. A further difficulty is to be found in the fact that the rays of radium, though affecting normal tissues to a much less extent than morbid tissues, do affect them, and thus once again we find a hindrance to the unlimited increase in the power of the radium employed. Time may show how these difficulties may be overcome, but with all its limitations the use of radium has afforded us substantial aid in the treatment of some very difficult pathological conditions.

Annotations.

"Ne quid nimis."

DIET STANDARDS FOR HARD WORK: SUPPLEMENTARY RATIONS.

AMONGST platitudes of special importance at the present time is the one which says that the greater the wear and tear of muscle substance which hard physical work involves the greater need is there for an abundant diet. When, therefore, a scheme of rations is formulated it is obvious that it should, as far as possible, be based on the peculiar needs of the individual. The war has brought a vast concourse of people—the figure has been officially estimated at six millions—into an arena of industry which involves hard and continuous physical strain. Guided by their physiological advisers, the Ministry of Food, in realising this fact, have decided upon a scheme providing for supplementary rations for all persons classed as heavy workers. There is bound to be some difficulty in administering the benefits of such a scheme equitably, but so far the Ministry seem to have evolved a plan which promises to secure an all-round administration adjusted by a scale to the various grades of workers. To begin with, the scheme does not provide an increase in the allowance of butcher's meat, but a supplementary ration limited to bacon, rabbits, poultry, and meat other than butcher's meat. The increased allowance will amount approximately to an advance of 50 per cent. on the ration upon which the supply of meat food to the population of London and neighbouring counties is now based. Those entitled to the increased allowance are to be divided into three classes as follows: F, men on very heavy industrial work, E, men on heavy agricultural work, and D, men on heavy industrial work. Persons engaged in professional and commercial occupations, office staffs, clerks, commercial travellers, dealers, shopassistants, messengers, indoor domestic servants and others engaged in similar occupations are excluded from the provisions of the supplementary scheme. A circular giving particulars as to the duties of an employee entitled to the supplementary ration will be issued, it is stated, to the local food committees. The business of these committees will be to distribute forms of application to those persons entitled to the extra allowance of food, who will be required to state their occupation, their employer, and the exact kind of work in which they are engaged. Supplementary ration cards in accordance with the decision of the committee will then be issued corresponding with the classes of heavy labour scheduled above. Some reservation appears to be made in regard to women workers, though there can be no question that a woman as a physiological machine is on the same plane as a man when the demands are those of excessive toil. We understand, however, that a limited number of women will share the same extra allowances of food, provided that their work is more strenuous than that implied by "ordinary factory work not involving exceptional physical exertion or exposure to heat or weather." The grading of rations introduces a principle of administration which, while physiologically sound, will, no doubt, be faced with difficulties in practice, but it is to be hoped that common-sense will prevail. The comparison is often drawn between the steam-engine and the human machine as two going concerns,

inasmuch as the energy of the one is derived from the fuel supplied and the energy of the other from the food consumed. While the analogy is partly true, it breaks down when we consider that the human body is also a self-repairing machine. The supply of fuel to the steam-engine does not compensate the depreciation of its parts. On the other hand, food automatically does this for the human machine, and the consideration of this truism has rightly prompted the Ministry of Food to make allowance for the increased demand created by the extra wear and tear of intense industrial activities. Professional workers are excluded from the scheme, whatever the strain upon their actual muscular powers, though many of these, notably the doctor doing treble work, can plead that his physical wear and tear is of the severest sort.

PLAGUE IN INDIA.

TWENTY-TWO years have passed since plague began its ravages in India, and during that time the disease has carried off not far short of 10 millions of victims. Owing to the fluctuations of the mortality and the temporary reduction at times in the number of plague deaths, some sanguine minds have confidently predicted a speedy cessation of the epidemic, on the score that its virulence was becoming exhausted, and that, in popular language, "it was burning itself out." The highest point of the plague prevalence was reached in 1907, when no fewer than 1,315,892 persons died of the disease during the year. The next two years witnessed a considerable decrease in plague mortality, for in 1908 only 156,480, and in 1909 178,808, deaths were recorded. Unfortunately, this diminution has not been maintained, and for the last eight years the annual average number of plague deaths has been 420,836. The latest figures available—namely, the provisional returns for 1917—show that close upon half a million of lives were sacrificed in India to plague during the year. So that it cannot be said that, taking India as a whole, there are as yet any indications that the pestilence is abating.

During the past 22 years the incidence of plague in the various Indian provinces has been unequal. The Punjab, for instance, has suffered very severely, as will presently be seen, while Assam has practically escaped altogether, having, since its reconstitution as a separate province in 1912, had only one solitary case and that an imported one, up to the end of 1917. The three administrative areas that have suffered most from plague have been the Punjab, the Bombay Presidency, and the United Provinces of Agra and Oudh. These three areas have a combined population of about 98 millions—that is, a little less than one-third of the total population of India. During the 22 years the Punjab has had 2,861,459 deaths from plague, Bombay Presidency 2,247,906, and the United Provinces 2,187,596, making a total of more than 7½ millions of plague deaths out of the approximate total of 10 millions for the whole of India during that period. Much valuable knowledge has been gathered in India respecting the etiology and prevention of plague, as a result of the labours of the two Royal Commissions that have visited India, and through the investigations carried out by the experts employed by the Advisory Committee appointed jointly by the Secretary of State for India, the Royal Society, and the Lister Institute. Much, too, has been done in adding to the common stock of knowledge regarding plague by the officers of the Indian Medical Service both in the laboratory and in the field. Unhappily, the fact remains that, in spite of all that has been done to check the ravages of plague in India, the disease continues to prevail apparently unchecked. This unsatisfactory situation is probably, to a large extent at least, owing to the attitude taken up by the natives of India with respect to the anti-plague measures. These people have violently resisted any attempts that appeared to interfere with their habits and customs, and have bitterly resented any suspected encroachments upon their religious practices. Even the trapping and poisoning of rats met with active opposition. Isolation of the sick was strenuously resisted, members of the plague staff were stoned in the streets, lady doctors were mobbed on their rounds, riots developed, hospitals were burned, and some of the men guarding them were killed; and in at least one instance a high official was assassinated who had been regarded as responsible for the introduction of the obnoxious anti-plague regulations into a populous district. After this it was thought prudent to modify the policy and attempts were made to educate the people, the hope being that in time they would be sufficiently informed to appreciate the value of the measures suggested for controlling the disease. A large proportion, some say three-quarters, of the people of India live outside the large towns and maintain themselves and their families by cultivating small holdings, the produce of which provides food for the household. The grain grown in the fields is stored in the houses or close by, and is easy of access to rats which swarm in large numbers in and around the dwellings sharing in the family food-supplies. The opinion of some experts is that the districts in India where plague has failed to establish a footing are those in which the construction of the houses and the habits and customs of the inhabitants are such as to be unfavourable to infestation of the dwellings by rats. The old saying still holds good, "No rats, no plague." It is a well-known fact that rats are found wherever corn is stored, and that where rats are present there are also rat-fleas, the actual agents in the transmission of bubonic plague to man. Lieutenant-Colonel D. T. Lane, I.M.S., at the time chief plague medical officer for the Punjab, published a report in 1915 in which he regretted the apathy and indifference of the people in the matter of the prevention of plague, asserting that if each householder kept his house free from rats there would be no more plague. There were, Colonel Lane went on to observe, 15 millions of rat-holes in the 21 affected districts of the Punjab, and if the people could only be roused from their apathy and made it impossible for the rats to live in these holes the plague prevalence would subside. The efforts to educate the Indian people in the prevention of plague had hitherto been confined to men who, having cattle and crops to attend to, spent little time in their houses. As plague in India is a house disease, the women should be taught how to prevent the spread of plague. In Colonel Lane's opinion, if once the women understood that rat-holes and unswept floors endangered the lives of their husbands and children they would immediately do their duty and thus avoid the malady. The year 1915 was the worst as regards plague in the Punjab since 1907, for no fewer than 244,104 persons died of the disease in the province. Whether it was a pure coincidence or the result of Colonel Lane's education of women, there were only 4151 plague deaths recorded in the Punjab during 1916, and 8331 in 1917, the annual average of the 10 years, 1906 to 1915, having been 135,850. This remarkable reduction of the plague mortality in the Punjab was not shared by the other two provinces, which, along with it, were the chief sufferers from the disease in past years, for, while in the Bombay Presidency the plague deaths in 1915 amounted to 43,824, they were 79,507 in 1916 and 153,098 in 1917. In the United Provinces the plague mortality in 1915 was 58,128, and in 1916 and 1917 the deaths numbered respectively 49,368 and 118,957.

It will be interesting to see if the diminution of plague mortality in the Punjab is maintained during the present year.

THE INVESTIGATION OF ATMOSPHERIC POLLUTION.

WE publish this week in a Special Supplement the Third Report of the Committee for the Investigation of Atmospheric Pollution, the observations recorded being those made during the year 1916–17. As announced last year, an important change was made in the whole scheme of investigation, inasmuch as the work was placed under the control of the Meteorological Office, the original committee being constituted an "Advisory Committee on Atmospheric Pollution" to that office. This committee has since been enlarged by the addition of representatives from important districts in which investigations are conducted. In spite of the difficulties raised by war conditions, it may be said that this valuable work is being prosecuted with commendable activity, as the present report abundantly shows. A valuable amount of research work has been carried out, chiefly in

the direction of investigating methods of measuring suspended impurity in the atmosphere. The original methods outlined by the committee in regard to measuring the amount of impurity deposited or washed out of the air and the determination of the nature of the impurities have been adhered to; it is hoped, however, soon to supplement these methods by introducing a simple means of estimating the amount of matter in suspension in the air as distinct from that deposited. As the present report points out, while the nature and quantity of deposited matter are of great importance from the point of view of injury to buildings and plant life, the very finely divided matter which remains in suspension is probably of greater significance from a hygienic point of view. It is the suspended matter which we breathe into our lungs and which cuts off the sunlight. The report shows, however, by the original methods of examination that the deposit of insoluble impurity does not depend upon rainfall, while there is some indication that the soluble part of the impurities deposited is influenced by rainfall. This latter observation might be anticipated. Dr. J. S Owens has devised an apparatus for the estimation of suspended solid pollution in the atmosphere, and Mr. J. G. Clark has taken great pains to render this method quantitative. This method should bring into prominence the results of the efforts to economise fuel by abating smoke. Taking the results of this year's report on the whole, there is an increase shown in the total deposit on previous years for the summer months, while there is evidence of considerable improvement again during the winter months. On the face of it, this would seem to imply that the methods of domestic firing are gradually improving, but it is early yet to make a definite conclusion upon this point. The work is clearly of national importance, particularly as official inquiries are now being set on foot to investigate the question of economising fuel. We hope that the committee will add to the success of its efforts by securing further practical workers.

PROJECTILE CARRIED IN THE INFERIOR VENA CAVA TO THE HEART.

INSTANCES of projectiles lodged in the cavity of the heart, and even instances of their successful removal, have been recorded in the war. The projectiles have usually penetrated the cardiac wall. At a recent meeting of the Académie de Médecine of Paris M. F. Menuet reported a remarkable case in which a projectile was carried to the heart in the inferior cava.

A soldier, aged 22 years, was wounded by a shell fragment and taken to a field hospital two and a half hours later. In addition to wounds of the lower limbs there was an orifice of entry over the right seventh rib in the axillary line. Radioscopy did not reveal any projectile in the liver or in the rest of the abdomen, but the movements of the diaphragm were diminished, especially on the right side. At the cardiac apex an opaque spot was observed, especially on forced inspiration. Its size corresponded to that of a shrapnel bullet slightly flattened. It followed exactly the cardiac impulses, and showed a kind of gimblet-like movement. It did not appear to participate in the respiratory movements. It was calculated to be at a depth of 40 mm. Although there was no radiologic sign of hæmothorax or hæmopericardium, to explain the entry of the bullet into the heart, and the symptoms—good facies, good pulse, slight dyspnœa, normal heart sounds—were mostly negative, M. Menuet concluded that there was an intracardiac projectile. But this view was received with scepticism, and the surgeon in charge of the case only opened up the wounds of the lower limbs under spinal anæsthesia, during which a serious attack of syncope occurred. On the following day the patient was restless and cyanosed, the pulse-rate and the dyspnœa increased, and an icteric tint appeared and gradually augmented. On the third day death took place. The necropsy showed that the right lobe of the liver had been traversed and contained a large tortuous cavity without any apparent orifice of exit. There was little blood in the abdominal cavity. The pericardium and surface of the heart were intact. At the apex of the right ventricle was found a projectile about the size of a filbert. It could have entered the heart only by way of the inferior vena cava. Near the entrance into it of the hepatic veins was a slight retroperitoneal hæmatoma.

In an annotation in THE LANCET of April 7th, 1917, we described a case recorded by Professor Lyle, of Columbia University, in which a shell fragment migrated from the femoral vein to the right ventricle. Its presence was not diagnosed during life, as, unfortunately, radioscopy did not extend beyond the neighbourhood of the wound in the thigh.

Sir John Phillips has been appointed Honorary Physician to the Queen.

THE Editor of the *British Medical Journal* and the Editor of *The Lancet* were elected at the annual meeting of the Royal Medical Benevolent Fund Vice-Presidents of the Fund, in recognition of assistance given to the work of the affiliated War Emergency Fund.

THE Library and Offices of the Royal Society of Medicine will be closed from Thursday, March 28th, to Saturday, April 6th, both days inclusive, but officers of the R.A.M.C. and Colonial and Allied Services will be admitted to the Library between the hours of 11 and 6.

THE annual meeting of the Society for the Study of Inebriety will be held in the rooms of the Medical Society of London, 11, Chandos-street, Cavendish-square, London, W., on April 9th, at 4 P.M., to appoint President, Council, and officers for the ensuing session, and to receive the report of the Council and financial statement, after which a discussion will be opened on Industrial Alcoholism by Dr. William Charles Sullivan.

THE Association of Panel Committees established in October last has issued a memorandum appealing to all panel committees to take the opportunity afforded by the association of expressing the views of the panel profession with an authority which will compel favourable consideration. The March issue of the *London Panel Committee Gazette*, circulating among practitioners on the panel in the County of London, in discussing such large issues as Parliamentary representation and Poor-law reform, recommends its readers to support the association.

THE BELGIAN DOCTORS' AND PHARMACISTS' RELIEF FUND.

SUBSCRIPTIONS.

THE following subscriptions to the Fund have been received during the week ending March 18th:—

	£	s.	d.		£	s.	d.
Dr. Matilda Hunt	3	0	0	Dr. F. R. Mallett	1	1	0
Mr. Herbert Tilley ...	5	5	0	Dr. Mark Style	2	2	0
Dr. Charles Pollard ...	2	2	0				

Subscriptions to the Fund should be sent to the treasurer of the Fund, Dr. H. A. Des Vœux, at 14, Buckingham Gate, London, S.W. 1, and should be made payable to the Belgian Doctors' and Pharmacists' Relief Fund, crossed Lloyds Bank, Limited.

ROYAL MEDICAL BENEVOLENT FUND.

THE annual general meeting of this Fund was held at 11, Chandos-street, Cavendish-square, on March 12th, Dr. Samuel West, the President, being in the chair.

The annual report was read and approved, the chief event of the year in the activities of the Fund—namely, the second appeal for the War Emergency Fund—being dealt with in detail. This Fund was instituted in 1916 to afford assistance to medical men, who in consequence of having joined the medical service of the Army and Navy, found themselves in temporary financial difficulties. As the report said:—

> Many medical men, when called up, had to leave on very short notice, without time to make adequate provision for the continuance and maintenance of their practice during their absence. As a result, they had to face a severe fall in income, even when supplemented by Army pay, while many expenses, such as rent, insurance, taxes, family maintenance, and education, could not be materially reduced. Although in a year or two after their return it may be hoped that those affected will recover their position, still in the interval help is, and will be, required, and it is to meet these needs that the War Emergency Fund was instituted. To be effective the grants must be made on a liberal scale and the Fund, from which they are to be drawn, must be a large one.

The first appeal was started in 1916 and yielded £3892, but in 1917, in the second appeal, £25,000 more were asked for. A general meeting of the profession was convened, an influential committee elected, and at the same time a special subcommittee was appointed to whom the administration and management of the special Fund could be delegated. The second appeal, said the report, had yielded up to the end of 1917 £9516, the two appeals together amounting to £13,000, but since that date promises, dividends, and extra subscriptions had raised this total to £15,000. The report continues:—

> There is no profession which has been so hard hit by the war. It is the only profession which was called out as a profession, and it gave its services unreservedly and without grudging, though often at very great personal sacrifice. The extraordinary value of the service rendered to the nation is shown by the remarkable freedom which the Forces have enjoyed from diseases which were formerly the scourge of armies in the field and by the success of modern medical and surgical methods. As there has never been a war on such a scale as this, so there has never been one in which the incidence of preventable diseases has been so small, and this is due to the progress and practice of medical science and to the whole-hearted enthusiasm with which the medical profession has devoted itself to the work. But in spite of the demands of the war the finances of the Fund are in a satisfactory condition.
>
> In the grant department the total donations and subscriptions for the year amount to £2713 10*s.* 9*d.*, which is an increase of £645 15*s.* 5*d.* over that received last year. This includes a legacy of £105 left for the general purpose of the Fund by Lieutenant-Colonel Leahy. The amount distributed was £2149 15*s.* 8*d.* in ordinary grants, in addition to which war-time gifts were made at Christmas of £120, making a total of £2269 15*s.* 8*d.* This is a slight decrease upon the amount distributed in the previous year, but is explained by the fact that 12 new annuitants were taken from the list of long standing grants whose age qualified them for annuities, to the relief of the grant department, as the results show.
>
> In the annuity department the income for the year was £2911 9*s.* 4*d.*, which is £75 11*s.* 8*d.* less than the income of last year. This decrease is apparent only, on account of the larger amount deducted from the dividends for income-tax, but when this had been refunded it made the total income really about £200 more. The amount distributed was £3060 11*s.* 8*d.*, the sum of £161 in addition was spent in Christmas gifts of an extra £1 each, bringing the total distribution to £3221 11*s.* 8*d.*, an increase of £121 8*s.* 4*d.* over that of the previous year. The number of annuitants remains the same—viz., 161.
>
> The committee has given serious consideration to the question of disputes as to legacies or donations arising between the Fund and Epsom College. It feels strongly that all such disputes should be settled between the two bodies amicably and without litigation. It has decided so far as the Fund is concerned that it is willing to submit all such questions to arbitration where they cannot be settled easily by mutual agreement.
>
> The Fund and the College both stand in the position of trustees, and may not without the sanction of the court forego their legal rights, but in cases of legitimate differences of opinion arbitration would offer the easiest and most amicable way of settling such difficulties when they arise.

The death of Mr. Parker Young, a member of the committee for 40 years and for 20 years chairman of the Fund, formed the subject of a strongly worded expression of regret, while the report concluded with this testimony to the services rendered by the medical press:—

> Not only in the customary way by publishing the abstracts of the cases relieved month by month, but more particularly by furthering in every way possible the recent appeals, making them widely known and writing in their support. Dr. Dawson Williams, the Editor of the *British Medical Journal*, and Mr. Guy Elliston, the General Secretary of the British Medical Association, and Dr. Sprigge, the Editor of *The Lancet*, have taken the greatest personal interest in the work, and the warmest thanks are due to them individually.

Dr. West was re-elected as President; Colonel Charters J. Symonds, hon. treasurer; and Major Newton Pitt, hon. secretary; and the committee of management was elected.

CANADA.

(FROM OUR OWN CORRESPONDENT.)

Quackery in Ontario: A Valuable Report.

FOR three years Mr. Justice Hodgins has been acting as a special commissioner to inquire into medical education in the Province of Ontario, the Medical Practice Act, and the status of Christian Scientists, osteopaths, "chiropractors," "optometrists," the practitioners of various methods of "physical medicine," and of nursing purporting to be medical. His report has just been laid before the Ontario Parliament now in session, and if the changes advocated by the learned commissioner are carried into effect there will be a veritable elimination of quacks and fakirs in that province. The scope of the inquiry covered a wide field, for not only did the commissioner call all the parties interested before him at various times, but he made several trips to different so-called colleges of osteopathy and "chiropractics" in the United States, to get full information at first hand. The following are his more important recommendations:—

> The immediate establishment of an institute of physical therapy on the premises of the Toronto General Hospital, with a staff selected from those having special training, particularly in war work. Installation in the Department of Physics of the University of Toronto of medical equipment in physical therapy for the instruction of students. A course for medical students in physical therapy with a view to preparing qualified graduates.
>
> The practice of medicine to be properly defined. Osteopaths, "chiropractors," and other "drugless healers," practising in Ontario up to June 30th, 1913, to be permitted to continue for six months from Jan. 1st, 1918, without being subject to any disability or prosecution. No one to be permitted after July 1st, 1918, to practise medicine without a licence from the College of Physicians and Surgeons of Ontario excepting those practising osteopathy on June 30th, 1913, including a certificate from one of the five colleges recognised by the American Osteopathic Association, and, having had five years' practice in osteopathy, obtained a certificate from that association that they are qualified to pass an examination for licence in the State with the highest standard. Those to be permitted to practise *under a special licence* from the Minister of Education for the Province. A clause making it clear that there is nothing to prevent the practice of the religious tenets of any church, providing that any person exercising religious healing for gain shall be required to possess a permit from the Ontario Board of Health certifying that the holder is required to be reported under the Public Health Act. Optometry is to be taught in courses to be arranged by the Faculty of Medicine of the University, the Optometrical Association, and the Toronto Technical School for the Education of Students. A student on passing this course will be entitled to style himself optometrist. Provincial registration of nurses is to be established with local branches where nurses may be registered according to their qualifications.
>
> A medical director should be appointed for the province, and the constitution of the College of Physicians and Surgeons amended. Referring specially to osteopathy in the United States, the Commissioner states that he finds that osteopathy is steadily finding its place, having certain value, but he cannot accept "chiropractors" as part of the recognised profession of medicine, as "it is a system which denies the need of diagnosis, refers 95 per cent. of diseases to one and the same cause, and turns its back on all modern medical and scientific methods as unworthy to be even discussed."

Regarding the position of the medical profession towards these new cults, Mr. Justice Hodgins regrets that the attitude of the profession is that of knowing nothing, and wanting to know nothing, about these cults. Regarding Christian Sciences in particular, there should be no interference with the right of that sect to practise their faith, but the interests of public health demanded that Christian Science healers should be held responsible for mistakes in diagnosis and treatment. They should conform to the regulations, and when they act for gain they should be required to possess sufficient medical knowledge to recognise disease pronounced by the health authorities to be communicable. For the "healer" who attends a person suffering from communicable disease without first notifying the health authorities heavy penalties are recommended.

The relations between the College of Physicians and Surgeons and the Universities of the Province are dealt with at considerable length, and it is recommended by the Commissioner that it would not be advisable to do away with the present independent examinations of the different bodies. He would leave the universities to decide whether they would divide their degree-conferring power by having a joint examination. The proposal to appoint a medical director for the province is endorsed by the Commissioner, so that the public may have some provincial authority to whom to appeal against the evils to which a monopoly might give rise.

March 1st.

Correspondence.

"Audi alteram partem."

UNAUTHORISED ATTENDANCE ON PENSIONERS.

To the Editor of THE LANCET.

SIR,—I am desired by the Minister of Pensions to ask your permission to call attention to a matter of some importance affecting the interests both of medical practitioners and of the public. Cases have come before Mr. Hodge in which both discharged disabled men and wives of serving soldiers or widows whose husbands have been killed in the war have obtained medical attention during illness, and on being presented with the bill by the practitioner have appealed to the Local War Pensions Committee or to the Ministry for assistance towards meeting it. It is clearly contrary to all principles of sound administration that bills thus presented after the events should be recognised as a charge upon public funds. A disabled man is entitled under the instructions of the Ministry to apply to his Local War Pensions Committee for the treatment necessary to his case, and is instructed to do so by notification at the time of his discharge and by public notices in post-offices and elsewhere. Similarly, widows of men who have been killed and the wives and dependents of serving soldiers are in cases of serious illness entitled to ask the assistance of their Local War Pensions Committee. Practitioners should therefore realise, if they take up cases without previous understanding as to the extent of assistance which will be given by the Local War Pensions Committee or the Ministry, that they do so at their own risk, and that the Minister cannot be held liable for any charges which may be incurred.

I am, Sir, your obedient servant,

MATTHEW NATHAN,
Secretary.

Ministry of Pensions, Millbank, S.W., March 19th, 1918.

*** The position of a pensioner is similar to that of an insured person under the National Insurance Scheme. He is entitled to a generous measure of medical aid after complying with certain necessary formalities. The medical man will be acting in the best interests of the pensioner as well as in his own by assuring himself before giving advice or treatment that these formalities have been observed.—ED. L.

THE DEBATE ON TWILIGHT SLEEP.

To the Editor of THE LANCET.

SIR,—The no doubt necessary curtailment of my remarks in this debate (at the recent meeting of the Hunterian Society) omits points which may be of considerable importance to a right understanding of the question. I considered Dr. Blacker's address very valuable as he had brought into prominence the disadvantages of "twilight sleep," whereas the previous discussion at the Obstetrical Section of the Royal Society of Medicine had almost entirely turned upon its advantages.

It is now clear that there is an added risk of increased morbidity, and perhaps even of mortality, in both mother and child when labour is conducted under morphia-scopolamine narcosis, for Dr. Blacker has proved that the second stage of labour is prolonged owing to uterine inertia, and that to remedy this either pituitary extract has to be administered, or delivery instrumentally effected at a higher rate than the normal average. The increased use of forceps must necessarily tend towards increased lying-in morbidity and chronic pelvic gynæcological troubles even in the hands of experts. Dr. Blacker's warnings and Dr Herbert Spencer's remarks in your issue of March 16th (p. 408) are clear evidence on this point.

Dr. Blacker did not show what were the *special* contra-indications for "twilight sleep," nor did he indicate that it did harm even in chronic heart or lung troubles. He has shown, however, that to adopt it as almost a routine or constant practice, as advocated by some speakers at the meeting at the Obstetric Section, is clearly inadmissible, and his warnings are serious and potent. No doubt there are cases where this narcosis can be safely and usefully recommended if the case be in expert hands. It would probably be right to advise "twilight sleep" for a nervous woman whose exaggerated memory of the painful birth of her child might otherwise act as a deterrent to any subsequent chance of conception; but even in such a woman the use of chloroform towards the end of labour is often able to so obliterate the pains of the second stage that memory would not thus act, especially if the child lived.

I should like to ask if any ill-effects have been noticed in children who survive after exhibiting marked oligopnœa at birth.

I am, Sir, yours faithfully,

Manchester-square. AMAND ROUTH.

*** Evidence ought to be forthcoming from which to reply to Dr. Routh's very pertinent closing question.—ED. L.

CHRONIC GONORRHŒAL INFECTION OF THE PROSTATE AND VESICLES.

To the Editor of THE LANCET.

SIR,—I have read with much interest Dr. A. S. Cobbledick's article on recurrent irido-cyclitis in THE LANCET of March 2nd and venture to congratulate him on drawing attention to the very important rôle the prostate plays in harbouring gonococci for many years after apparent cure of gonorrhœa; but I would like to add the "seminal vesicles" as often being the habitat of the gonococci in cases when the prostate itself shows no sign of enlargement or infection. The existence of gonorrhœa latent in the vesicles and prostate has been lately brought home to those of us engaged in genito-urinary work by the number of men returning from the front with a recrudescence of a gonorrhœal discharge, originating in an attack of years ago, perhaps 5–10 or more; doubtless the severe strain of life at the front has resulted in the setting free of gonococci pent up in the vesicles or prostate to reinfect the canal—I place the vesicles first advisedly—so often they are overlooked by the examining finger which feels only for the outline of the prostate. I am surprised that any genito-urinary expert should consider gonorrhœa cured when discharge and symptoms have ceased; certainly the expert mentioned who denies the indefinite life in the tissues of the gonococcus must have had but little clinical experience, since proof to the contrary is a matter of everyday occurrence.

With regard to the cases of recurrent irido-cyclitis, I am astounded to read the assertion, "I have never seen a case of recurrent I.C. in which any attempt has been made to obtain a cure." Five years ago at All Saints' I remember Mr. Canny Ryall demonstrating two cases of R I.C. which had been sent on to him for diagnosis and treatment by members of the staff of Moorfields Ophthalmic Hospital, which cases were under treatment by massage of the vesicles and prostate. Since that date, in my daily work at All Saints', many such cases have been treated and I have been much impressed by Mr. Canny Ryall's teaching that gonococcal infection of the vesicles and prostate may be the fount and origin of many other diseases, notably fibrositis, arthritis, sciatica, and backache. Mr. Ryall also insists that even where gonococci are not found the vesicles and prostate may be the seat of a secondary infection (staphylococci, *B. coli*, &c.), which infection is enough to keep up the diseases mentioned and which can be cured only by efficient massage, &c., though these cases are often very tedious. I may recite a recent case of my own. Man of 58 with all classical signs of enlarged prostate obstructing the flow of urine. A history of gonorrhœa ten years ago suggested infected vesicles. On examination prostate moderately enlarged. Vesicles much distended and hard and very tender. Gentle massage has already relieved all the urgent symptoms, especially the frequent nocturnal urination. An additional method of cure is by periodical stretching of the posterior urethra by Mr. Ryall's expanding dilator to 45 French, which empties the prostate and prostatic ducts of their secretions. In searching for the gonococci we find at All Saints' that examination of the secretion expressed by massage is often successful in demonstrating the gonococci, or examination of the threads which have been fished out by a platinum hook from the urine and spread on a slide.

References to this subject in the text-books are but scanty; indeed, our text-books are so often but repetitions, and perhaps one should not be surprised when one considers

the neglect of genito-urinary work at our large London general hospitals, the teaching on such subjects as syphilis and gonorrhœa having been lamentable, and the opportunities of students for obtaining first-hand knowledge meagre in the extreme. Consider seriously this advice given to a patient of mine, an officer under treatment in one of our largest naval hospitals, "Massage your own prostate daily"—surely a feat within the compass only of the domestic cat.

I am, Sir, yours faithfully,

Grafton-street, W., March 13th, 1918. ROLF CREASY.

THE LIBRARY OF THE ROYAL SOCIETY OF MEDICINE.

To the Editor of THE LANCET.

SIR,—I notice in your article on Medical Libraries in last week's issue that you refer to this library as having so many duplicates, that some readers have misunderstood it as depreciating the *net* value of our stock, and I would ask your kind permission to refer to the matter. I have consulted our librarian, Mr. Hewitt, and he states that while it is true we have a considerable number of duplicates, we have not, as would appear to be suggested, triplicates and quadruplicates, and most of the duplicates we do possess are of books over 20 years old. On the suggestion of Dr. Arthur Latham, honorary secretary of the Amalgamation Committee, who did so much to achieve the amalgamation, we have been trying to form a reference, as well as a circulating, library, and we try to get duplicates of all important books, and these are specially labelled and reserved "for reference only." Of important new books, I am glad to say, we have often in circulation as many as half-a-dozen copies, but we only buy *one* and *hire* the others, and exchange these for others as soon as the demand falls off; but of duplicates in our permanent stock I doubt if we have 2000.

I am, Sir, yours faithfully,

J. Y. W. MACALISTER.

1, Wimpole-street, London, W., March 18th, 1918.

*** Our annotation was certainly not intended to convey that the admirable library of the Royal Society of Medicine was encumbered with duplicates.—ED. L.

THE NATIONAL SPIRIT OF THE MEDICAL AND TEACHING PROFESSIONS.

To the Editor of THE LANCET.

SIR,—Mr. Bonar Law, speaking in the House of Commons on March 7th, said he did not believe the spirit of this country was weakening in the war and that if the question could be put, "Are you prepared to go on with the war until the results you set out to achieve have been attained, or are you not?" the response would be astonishing alike to our enemies and ourselves.

Mr. Bonar Law's question was a challenge to a certain attitude of mind amongst Parliamentarians which is disturbing to many people in these critical times. Debates in the House do not convey the idea of a solidly united nation. Carping criticism, undercurrents of party feeling, and intrigue find expression. Certain Members of Parliament forget their representative character, so long is it since they faced an election. We want to tell them that the nation is determined to see this thing through. In a sense everyone is war-weary, but the aims of the Allies have been put in almost identical terms by the Government, the Labour party, and President Wilson, and we only need the endorsement of the whole people.

It has occurred to us that the medical and teaching professions are in an exceptionally good position to initiate a response to Mr. Law's question. Neither of these professions can be described as capitalist. Their members are seldom keen party politicians and their international interests have long been such as to make a narrow nationalism impossible to them.

Plans for reconstruction after the war also demand attention. Unless there is a satisfactory peace these plans will be brought to naught, and we shall have to prepare for the next war, which German writers are already discussing. The members of both our professions, being brought into contact with all sorts and conditions of men and homes, are well able to realise the great need there is for these schemes of reconstruction. The cry for reforms is in the air, but there is also the chance that even after a satisfactory peace we may settle down as before without tackling the crying evils in our midst, hence the need for a declaration of policy on this point.

We suggest that these two professions should take steps to arrange for meetings to be held throughout the country on Empire Day, to be presided over by the Lord Mayor, mayors, and chairmen of county councils, for the purpose of giving the Government an answer to the question of the Chancellor of the Exchequer and, further, for the purpose of pledging the nation to the execution of such reforms as are needed to bring about that better country which shall be a noble and lasting memorial of those of our countrymen who have laid down their lives for what we believe to be the most sacred cause which ever sent a nation to war.

Practically our suggestions are these:—

1. That the members of the medical and teaching professions in every county and county borough should approach the elected head of their local government area and request him to call a public meeting.

2. That at this public meeting two resolutions should be submitted. The first would express the determination of the country to secure a satisfactory peace; the second would pledge the country to far-reaching schemes of reconstruction after peace is declared.

We are, Sir, yours faithfully,

JOSEPH BATEY,
Head Master, Carter Knowle Council School.

ISABEL CLEGHORN,
Past President of the National Union of Teachers.

CHARLES W. COWEN,
Hon. Secretary, Sheffield Branch of the National Union of Teachers.

A. W. FORREST,
Hon. Secretary, Local Medical War Committee.

J. A. GREEN,
Professor of Education; Dean of the Faculty of Arts.

J. H. HICHENS,
Head Master, King Edward VII. School.

O. H. HUDSON,
Chairman, Sheffield Branch, British Medical Association.

JOHN W. ILIFFE,
Principal, Central Secondary Schools.

J. B. LEATHES,
Dean of the Faculty of Medicine.

A. C. P. LUNN,
Head Mistress, High School for Girls.

R. J. PYE-SMITH,
Emeritus Professor of Surgery.

HAROLD SCURFIELD,
Professor of Public Health.

SOPHIA WITTS,
Hon. Secretary, Sheffield Branch, British Medical Association.

Sheffield, March 18th, 1918.

URBAN VITAL STATISTICS.

(Week ended March 16th, 1918.)

English and Welsh Towns.—In the 96 English and Welsh towns, with an aggregate civil population estimated at nearly 17,000,000 persons, the annual rate of mortality was 16·6, against 15·7 and 16·7 per 1000 in the two preceding weeks. In London, with a population exceeding 4,000,000 persons, the death-rate was 17·8, or 0·3 per 1000 above that recorded in the previous week; among the remaining towns the rates ranged from 6·7 in Smethwick, 7·0 in Southend-on-Sea, and 7·2 in Ilford to 23·6 in Norwich and in Bath, 24·9 in Swindon, and 39·2 in Barnsley. The principal epidemic diseases caused 614 deaths, which corresponded to an annual rate of 1·9 per 1000, and included 244 from measles, 231 from whooping-cough, 68 from diphtheria, 55 from infantile diarrhœa, 9 from scarlet fever, and 7 from enteric fever. Measles caused a death-rate of 4·0 in Stoke-on-Trent, 4·3 in Swansea, 5·5 in Great Yarmouth, 7·4 in Norwich, and 17·0 in Barnsley; whooping-cough of 2·3 in Middlesbrough, 2·5 in West Hartlepool, 2·7 in York, and 5·2 in Carlisle; and diphtheria of 2·3 in St. Helens. The 936 cases of scarlet fever and 1616 of diphtheria under treatment in the Metropolitan Asylums Hospitals and the London Fever Hospital were 3 and 28 below the respective numbers remaining at the end of the previous week; there were also 25 cases of small-pox under treatment on Saturday last, including 15 new cases admitted during the week. Of the total deaths in the 96 towns 213 resulted from violence. The causes of 38 deaths were uncertified, of which 6 were registered in Liverpool and 4 in Birmingham.

Scotch Towns.—In the 16 largest Scotch towns, with an aggregate population estimated at nearly 2,500,000 persons, the annual rate of mortality was 13·9, against 14·0 and 14·6 per 1000 in the two preceding weeks. The 320 deaths in Glasgow corresponded to an annual rate of 15·0 per 1000, and included 7 from measles, 5 from whooping-cough, 4 from infantile diarrhœa, and 1 each from enteric fever and diphtheria. The 73 deaths in Edinburgh were equal to a rate of 11·4 per 1000, and included a fatal case of scarlet fever.

Irish Towns.—The 163 deaths in Dublin corresponded to an annual rate of 22·0, or 2·3 per 1000 below that recorded in the previous week, and included 6 from whooping-cough and 1 each from measles and scarlet fever. The 190 deaths in Belfast were equal to a rate of 25·2 per 1000, and included 19 from whooping-cough, 6 from measles, 2 from infantile diarrhœa, and 1 from diphtheria.

HOSPITAL SUNDAY FUND AT BRISTOL.—The Hospital Sunday collections in Bristol for 1918 amounted to £3634, which is £473 higher than any previous year. There are a few collections still to be reported.

The War.

THE CASUALTY LIST.

THE following medical officers appear among the casualties announced since our last issue:—

Killed.

Capt. St. C. Dunn, Canadian Army Medical Corps, qualified at Manitoba in 1909, and was in practice at Gimli, Selkirk, prior to joining the Canadian Expeditionary Force.

Wounded.

Capt. J. F. Carroll, R.A.M.C.

CASUALTIES AMONG THE SONS OF MEDICAL MEN.

The following additional casualties among the sons of medical men are reported:—

Major R. D. de la Cour Corbett, Indian Infantry, attached Royal Flying Corps, died as prisoner of war at Changri, Turkey, elder son of the late Colonel R. de la Cour Corbett, D.S.O., R.A.M.C.

Flight Sub-Lieut. C. W. Emmett, R.N., accidentally killed whilst on active service, youngest son of Dr. R. Emmett, J.P., of Winton, Portsmouth.

Second Lieut. K. K. Muspratt, M.C., Dorset Regiment, attached Royal Flying Corps, accidentally killed whilst flying in Suffolk, youngest son of Dr. C. D. Muspratt, of Bournemouth.

Capt. F. J. D. Knowling, M.C., Argyll and Sutherland Highlanders, killed in action, younger son of Dr. E. M. Knowling, of Tenby, South Wales.

Second Lieut. G. F. Veraguth, Royal Artillery, died at Bristol of pneumonia following malaria contracted abroad, only son of the late Dr. C. Veraguth, of Cannes, France.

Second Lieut. J. N. Gough, Royal Field Artillery, killed in action, second surviving son of Dr. H. E. Gough, of Northwich.

THE HONOURS LIST.

The following appointment for valuable services rendered in connexion with the war is announced:—

C.B.—Maj.-Gen. (temp. Lt.-Gen.) T. H. J. C. Goodwin, C.M.G., D.S.O., Director-General, Army Medical Service.

The following medical and other gentlemen and ladies are appointed to the *Most Excellent Order of the British Empire* for services rendered Overseas in connexion with the British Red Cross Society and other Red Cross organisations:—

Commonwealth of Australia.

K.C.B.E.—J. W. Barrett, C.M.G., M.D.
C.B.E.—Maj. F. de V. Lamb, Mrs. E. F. Mitchell.
O.B.E.—Mrs. E. Anderson, P. Arnold, Dr. E. H. Barrett, C. A. B. Campion, Miss M. K. M. Chomley, Lady A. Creswell, Miss V. Deakin, J. O. Fairfax, Mrs. J. Gilruth, Lady G. James, Miss A. E. Miller, Lady M. E. Miller, Miss G. Owen, Mrs. F. M. Parker, Miss P. U. Robertson, Miss K. K. Thomas, R. E. Weigall, M.B.
M.B.E.—A. S. Austin, H. V. E. Calthrop, H. C. Cave, Mrs. I. F. Dean, F. De Boise, T. P. Draper, Miss K. Egan, E. G. Elworthy, W. J. Isbister, Mrs. E. Laidley, W. T. Robertson, Capt. R. A. D. Sinclair, Mrs. L. M. Skene, Miss N. C. Stephen.

Dominion of New Zealand.

M.B.E.—Col. W. H. S. Moorhouse.

Union of South Africa.

O.B.E.—Mrs. P. L. Chappe, Lady S. A. Smartt.
M.B.E.—Mrs. L. D. Bourne, J. Fairbairn, F. Rowland, Mrs. E. J. Searle, Mrs. K. A. van der Bijl.

Newfoundland.

M.B.E.—F. Steer.

Crown Colonies, Protectorates, &c.

C.B.E.—Lady A. Miles.
O.B.E.—A. R. Cook, M.D.
M.B.E.—J. B. Cassels, F. A. Collymore.

The following appointment for services rendered in connexion with the war is also announced:—

O.B.E.—Lt.-Col. C. E. P. Fowler, R.A.M.C.

With reference to the awards announced in THE LANCET of Oct. 27th, 1917, p. 658, the following are the statements of service for which the decorations were conferred (all are members of the R.A.M.C. unless otherwise stated):—

Bar to the Military Cross.

Temp. Capt. Oswald John Day, M.C.

For conspicuous gallantry and devotion to duty in leading his bearers through enemy barrages. He organised stretcher-bearers and effected the recovery of many wounded from close to the enemy's lines.

Temp. Capt. Archibald Fullerton, M.C.

For conspicuous gallantry and devotion to duty in dressing and evacuating 30 cases of another division and over 50 of his own battalion under most adverse conditions. His medical orderly was killed, leaving him single-handed, and one shell killed and wounded 12 of his stretcher-bearers.

Temp. Capt. N. J. H. Gavin, M.C.

For conspicuous gallantry and devotion to duty. He worked unceasingly for many hours at night dressing the wounded. When the medical officer sent to assist him was killed and the post was wrecked by shell fire, he continued his work of tending the wounded in the trenches and the open until relieved, although slightly wounded. He carried out his duties regardless of personal danger.

Temp. Capt. Arthur John Rushton O'Brien, M.C., African Med. Ser.

For conspicuous gallantry and devotion to duty in action. He repeatedly dressed the wounded under heavy artillery and machine-gun fire in the open, bringing out about 150 wounded with stretcher parties, until he himself was dangerously wounded whilst performing his duties close to the firing line.

Temp. Capt. David James Sheires Stephen, M.C.

For conspicuous gallantry and devotion to duty in making a most daring reconnaissance in search of an aid-post. Under very heavy fire he made arrangements for the removal of the wounded and bringing up medical supplies. On another occasion he took over the evacuation of the wounded and reorganised the system of evacuation, displaying cool judgment and contempt of danger in searching for the wounded. He set a fine example to his men.

The Military Cross.

Capt. John Alston, Spec. Res.

For conspicuous gallantry and devotion to duty when in charge of stretcher bearers. He worked unceasingly for 54 hours, during the whole of which time he was under heavy shell fire, evacuating the wounded and clearing the field with great rapidity and skill. He declined to be relieved until he had seen the work through, setting a splendid example of cheerfulness and courage to all who were working with him.

Capt. Robert Ringrove Gelston Atkins, Spec. Res.

For conspicuous gallantry and devotion to duty. For 72 hours he worked continuously with his stretcher squads under very heavy artillery fire. He worked throughout a whole night between the various regimental aid-posts and the advanced dressing station, organising the evacuation of a large number of stretcher cases. He set a splendid example to all under him.

Temp. Capt. Phillippe Bernard Belanger.

For conspicuous gallantry and devotion to duty. He moved about in the open, often having to jump from shell-hole to shell-hole, tending the wounded, regardless of the continuous machine-gun and shell fire. He was entirely responsible for the bringing in of many wounded men, and thereby saving their lives. He did not desist until he had the whole battalion sector cleared of wounded, and throughout he set a magnificent example to the stretcher-bearers who followed him.

Capt. Thomas Herbert Bell, Canadian A.M.C.

For conspicuous gallantry and devotion to duty during an attack. He directed the work of the stretcher-bearers for 48 hours without rest. His energetic work and splendid courage under heavy shell fire were an example to all ranks, and were undoubtedly the means of saving many lives.

Capt. William Somerset Birch, Spec. Res.

For conspicuous gallantry and devotion to duty. For 72 hours he worked with the stretcher-bearers of his field ambulance and collected the wounded under continuous fire. By his cheerfulness and disregard of danger he set a splendid example to all his bearers.

Temp. Capt. Archibald Grainger Bisset.

For conspicuous gallantry and devotion to duty. During heavy shelling of his battalion, when it was impossible to establish a dressing station, he went up and down the line himself attending to the men as they fell. Whenever a shell burst in the vicinity he at once hastened to the spot and did not leave the shelled area after his battalion had moved off until every case had been evacuated. He has shown the greatest gallantry and coolness at all times, notably on one occasion when, although badly gassed and unable to stand, he continued to attend to the wounded until he collapsed.

Capt. Arthur Bloom.

For conspicuous gallantry and devotion to duty. Several casualties were caused by shell fire at a battery position. He at once went 300 yards through a heavy barrage to the position, being blown up by an exploding shell on the way. He immediately attended to two wounded men, and then, while the battery was still being shelled, went round the position and attended to other wounded men. He displayed great courage, and his prompt action was of very great value.

Temp. Capt. Oswald Vincent Burrows.

For conspicuous gallantry and devotion to duty. For 40 hours he worked unceasingly succouring the wounded, about 300 of whom passed through his hands during that period.

Temp. Capt. Charles Kingsley Carroll.

For conspicuous gallantry and devotion to duty. He carried on his work during an attack in one of the most exposed situations regardless of his own safety. His energy and devotion to duty saved many lives.

Capt. John Philip Selby Cathcart, Canadian A.M.C.

For conspicuous gallantry and devotion to duty. During an attack he displayed masterly ability and the greatest devotion in attending to the wounded, and on one occasion, when stretchers were urgently required in the front line, personally carried out four from his dressing station—a distance of 1000 yards—under the heaviest shell fire. This very gallant act enabled several wounded men to be rescued. His work has at all times been characterised by fearless zeal and untiring energy.

Temp. Capt. John Percival Charles.

For conspicuous gallantry and devotion to duty. He worked untiringly evacuating the wounded during the attack, continually dressing the wounded in shell holes under very heavy fire until he was wounded. He set a magnificent example of fearlessness and devotion to duty.

Temp. Capt. Andrew Tocher Cunningham.

For conspicuous gallantry and devotion to duty during a raid on the enemy's lines. He worked continually throughout an intense bombardment attending to the wounded at the aid-post until they had all been attended to and evacuated. He showed great courage and devotion to duty.

Temp. Capt. Lionel Montrose Dawson.

For conspicuous gallantry and devotion to duty. While acting as officer in charge of bearers he searched and cleared the line during the advance and during a counter-attack. He kept the regimental aid-posts clear under trying circumstances, frequently going through a hostile barrage. He remained at his post for 24 hours without rest under very heavy fire.

Temp. Capt. Harold John de Brent.

For conspicuous gallantry and devotion to duty. He went about in a most fearless manner under heavy shell and machine-gun fire, collecting the wounded, dressing them in the open, and cheering them up. He remained in the most advanced position, almost surrounded by the enemy, until he had succeeded in attending to and clearing all the wounded. He took on the work of two other medical officers who were wounded, and remained at his post for a further five days. His conduct was magnificent throughout.

Temp. Capt. Carl Keating Græme Dick.

For conspicuous gallantry and devotion to duty. He rescued three men from a dug-out which had been blown in and brought them to his aid-post. His aid-post was under shell fire, but he went on working, and when his aid-post was full he continued work outside utterly regardless of his own safety. It was largely owing to his gallant conduct that so many wounded were safely evacuated.

Temp. Capt. James Dickson.

For conspicuous gallantry and devotion to duty at his aid-post when a shell exploded in the doorway, killing and wounding 14 persons in the room where he was. Although very badly shaken he continued his work until relieved 24 hours later.

Capt. Franklin Fletcher Dunham, Canadian A.M.C.

For conspicuous gallantry and devotion to duty. He remained at his dressing station for four days, steadily performing his duties although exposed all the time to shell fire and gas attacks. Although severely gassed on the second day, he continued to carry on until he collapsed, having set a splendid example of self-sacrifice and devotion to duty.

Lieut. Louis du Vergé.

For conspicuous gallantry and devotion to duty during an action. He constantly dressed the wounded in the open under heavy shell fire, and showed complete disregard for his own safety.

Temp. Capt. Henry Hawes Elliot.

For conspicuous gallantry and devotion to duty during several days' operations. He was out under very heavy fire finding wounded men, attending to them, and helping them back to the aid-post, and, though wounded, continued at duty. When his aid-post received several direct hits, he succeeded in evacuating all the wounded to a safer position. He set a fine example to his stretcher-bearers.

Temp. Capt. Henry Vincent Forster.

For conspicuous gallantry and devotion to duty during several days' operations. When a counter-attack seemed imminent he rallied every available bearer under heavy fire and evacuated all the wounded through a heavy barrage. He set a magnificent example to all.

Temp. Capt. Cosmo William Fowler.

For conspicuous gallantry and devotion to duty. He worked throughout the day during an attack, showing complete disregard of danger. On two occasions he went out in front of the line and brought in wounded who would otherwise have fallen into the hands of the enemy.

Temp. Capt. James Harcourt Cecil Gatchell.

For conspicuous gallantry and devotion to duty. He worked with great zeal for many hours in the open under heavy shell fire. He frequently dressed wounded men on the spot where they were hit, and when he was wounded he refused to leave his post until ordered to do so by his commanding officer. His contempt of danger and devotion to duty were an example to all ranks.

Temp. Lieut. John Alan Campbell Greene.

For conspicuous gallantry and devotion to duty. When an advance dressing station was shelled with 8-inch shells he at once went to the spot and began to dig out men who were buried. Though the shelling continued he did not desist until satisfied that the men were dead. He then assisted in clearing the entrance to the dressing station and attended to the wounded within. He showed an entire disregard of personal safety in his efforts to save life.

Capt. David Alexander Ross Haddon.

For conspicuous gallantry and devotion to duty. The dressing station was very heavily shelled, and he immediately ran to the centre of it, where he attended to all the wounded, and assisted in the evacuation of stretcher cases. He carried out operations in a hut which was continually under shell fire. He set a magnificent example to all.

Capt. John Livingston Hamilton.

For conspicuous gallantry and devotion to duty when in command of a stretcher-bearer subdivision during a raid on the enemy's lines. During an intense bombardment, and when he himself was twice wounded, he continued to dress the wounded throughout the night until they had all been evacuated. He set a magnificent example throughout the action.

Temp. Capt. David Cochrane Hanson.

For conspicuous gallantry and devotion to duty. Regardless of all danger, he attended to the wounded in the open under the heaviest shell fire, and, though knocked over several times by the explosion of shells, he continued to direct the work, and succeeded in getting the wounded out of the barrage zone. His gallant conduct was undoubtedly the means of saving many lives.

Temp. Capt. Arthur Randell Jackson.

For conspicuous gallantry and devotion to duty. He was ceaseless in his efforts to get in casualties, repeatedly going forward through enemy barrages to the advanced posts. He worked in the open throughout the day, and set a splendid example to his stretcher-bearers.

Capt. Charles Llewellyn Lander.

For conspicuous gallantry and devotion to duty. He worked at an advanced dressing station on the line of the enemy barrage, and afterwards passed through the barrage to another dressing station, where he worked for a day and a half under continuous shell fire. He showed great courage and disregard of danger.

Capt. Harold Dunmore Lane.

For conspicuous gallantry and devotion to duty. During a daylight raid on the enemy's trenches he established his aid-post in the front-line trench, and worked there for many hours under heavy artillery fire. He attended to the seriously wounded cases in the open, and was instrumental in bringing in all the wounded from No Man's Land and getting them successfully away.

Capt. Peter MacCallum, Spec. Res.

For conspicuous gallantry and devotion to duty. He was in charge of the evacuation of the wounded from an advanced position, and worked in the open under very heavy fire for four successive days and nights, organising stretcher squads and directing the removal of the wounded. He was the means of finding several severely wounded men lying in shell-holes and bringing them to safety under heavy fire. His splendid example and utter disregard of danger were largely responsible for the success of the evacuation.

Temp. Capt. Donald John Macdougall.

For conspicuous gallantry and devotion to duty. During the 70 hours the battalion was in the line he displayed great courage and fearlessness, dealing with a large number of wounded without assistance when all his orderlies had become casualties and his stores had been destroyed by shell fire.

Capt. Albert Edward Peel McConnell.

For conspicuous gallantry and devotion to duty when in charge of the evacuation of the wounded. Though heavily shelled he kept his line perfectly clear. He superintended the evacuation personally, working for 45 hours without ceasing under the most difficult and dangerous conditions, and by his example encouraged the men under him in every possible way. Later, he took two stretcher squads to the relief of batteries which were being heavily shelled.

Capt. Emmet Andrew McCusker, Canadian A.M.C.

For conspicuous gallantry and devotion to duty. Under continuous and heavy shell fire, during which his dressing station was several times hit, he not only carried out his duties as medical officer with coolness and energy, but on several occasions carried in wounded from the front when stretcher-bearers were not available. He also rescued, under a heavy shelling, a number of wounded men who were buried in a cellar. He set a splendid example to all.

Temp. Capt. Douglas Charles Murray Page.

For conspicuous gallantry and devotion to duty in going through a heavy barrage in search of two wounded officers, about 500 yards across the open. He dressed their wounds in the open by the light of the gun flashes. Hearing that the M.O. of the relieving unit had been wounded, he obtained permission to remain with the incoming unit.

Capt. Arthur Allan Parker, Canadian A.M.C.

For conspicuous gallantry and devotion to duty in directing the clearing of the wounded from his regimental aid-posts, being without rest for 36 hours, during all of which time he was exposed to more or less heavy shelling. He set a splendid example to his men.

Capt. William Barry Postlethwaite, Spec. Res.

For conspicuous gallantry and devotion to duty. He set a splendid example of untiring energy and contempt of danger to his stretcher-bearers throughout the operations, repeatedly leaving his aid-post under heavy fire to attend to the wounded. He organised bearer-parties and went forward with them into No Man's Land and brought in a large number of wounded.

Capt. James Wilfrid George Hewat Riddel.

For conspicuous gallantry and devotion to duty. While the battalion was assembling for the attack he attended to a large number of wounded on the spot. He was shelled out of his aid-post, but during the whole of the day of the attack he attended to the wounded under heavy fire, and at night, when all the cases at the aid-post had been attended to, he went out and dressed cases in No Man's Land and guided stretcher parties to the wounded lying out in front.

Capt. Stanley Graham Ross, Canadian A.M.C.

For conspicuous gallantry and devotion to duty during an attack. He directed the evacuation of the wounded for 48 hours continuously, and repeatedly aided the wounded under very heavy shell fire. The example which he set to all ranks, and his unbounded energy, was no doubt the means of saving many lives.

Temp. Capt. William Russell.

For conspicuous gallantry and devotion to duty. When his R.A.P. was blown in and most of the personnel and wounded killed, he went up to it through a heavy barrage and succeeded in evacuating all the survivors. On six occasions during the day he guided parties of bearers and brought back wounded, always in the open under heavy fire.

Capt. James Bethune Scott, Spec. Res.

For conspicuous gallantry and devotion to duty. A camp was heavily shelled and many casualties were caused. He showed great gallantry in going to the assistance of the wounded on three separate occasions in spite of heavy fire. By his coolness he not only saved many lives, but gave great confidence and encouragement to the men around him.

Capt. William Henry Scott, Canadian A.M.C.

For conspicuous gallantry and devotion to duty. During a heavy hostile gas-shell bombardment his dressing station, which was in a cellar, became full of "mustard gas." He and his whole staff were gassed, but with the greatest courage and devotion he remained in the cellar after all his assistants had been evacuated and attended to three wounded men who could not be left. No praise is too great for the gallant manner in which he discharged his duties under these dangerous conditions.

Temp. Capt. Edward Seguier Sowerby.

For conspicuous gallantry and devotion to duty in guiding parties of bearers and bringing back wounded in the open over most difficult ground and under heavy fire. On one occasion he led a party through a heavy barrage and succeeded in collecting many wounded from close to the enemy's line.

Temp. Capt. William Turner.

For conspicuous gallantry and devotion to duty. He had on two occasions to change his regimental post on account of its being destroyed by shell fire, but continued to dress the wounded of three batta lions throughout the day in the open under heavy fire.

Lieut. Samuel Vidot, Spec. Res.

For conspicuous gallantry and devotion to duty. He carried on his work continually under heavy shell fire throughout the operations, and stayed behind after the battalion was relieved to attend to the wounded. He had previously entered a dug-out which was full of fumes and rescued a wounded officer.

Temp. Capt. John Alexander Vlasto.

For conspicuous gallantry and devotion to duty. He attended to over one hundred cases of wounded under extremely heavy shell and rifle fire. During a gas and smoke cloud he worked ceaselessly in the firing line, attending to men gassed and wounded. His courage and total disregard for his personal safety were a splendid example to all around him, and were the means of saving many lives.

Capt. James Walter Woodley, Canadian A.M.C.

For conspicuous gallantry and devotion to duty. On being informed that there were some wounded lying unattended in an advanced and exposed position he at once went to the spot through a heavy barrage and attended to them. After dressing all the wounded he returned to his post and arranged for stretcher-bearers to take them to the dressing station. He went about continuously during the operations, attending to the wounded under most intense fire with complete disregard of danger.

MENTIONED IN DESPATCHES.

The names of the following medical officers are mentioned in despatches recently issued from the War Office dealing with military operations in East Africa, in Nyasaland, and in South Africa:—

Capt. A. P. M. Anderson, S. Afr. M.C.; Capt. R. S. Armour, R.A.M.C.; Maj. R. T. Brown, D.S.O., R.A.M.C.; Capt. G. T. Burke, I.M.S.; Maj. A. Cameron, I.M.S.; Surg.-Capt. J. A. Chisholm, Northern Rhodesia M.S.; Capt. A. R. Cook, Uganda M.S.; Capt. R. P. Cormack, R.A.M.C.; Lt. G. Covell, I.M.S.; Temp. Capt. I. B. V. L. Dale, E. Afr. M.C.; Capt. R. M. Easton, I.M.S.; Temp. Capt. A. G. Eldred, Spec. List; Capt. (acting Maj.) J. Evans, S. Afr. M.C.; Capt. G. B. Fleming, R.A.M.C.; Maj. (acting Lt.-Col.) W. Gilbert, S. Afr. M.C.; Temp. Capt. A. W. Goldsmith, S. Afr. M.S.; Capt. A. McW. Green, S. Afr. M.C.; Temp. Lt.-Col. H. H. Y. Hearsey, Spec. List, Div. Med. Serv.; Maj. H. Hemsted, R.A.M.C.; Maj. E. Hill, S. Afr. M.S.; Maj. G. G. Hirst, I.M.S.; Capt. E. V. H. Hodge, I.M.S.; Col. (temp. Surg.-Gen.) G. D. Hunter, C.B., C.M.G., D.S.O., A.M.S.; Capt. M. L. C. Irving, I.M.S.; Capt. (temp. Maj.) F. S. Jones, S. Afr. M.C.; Capt. W. H. Kauntze, W. Afr. M.S.; Capt. R. S. Kennedy, M.C., I.M.S.; Capt. J. D. Kidd, R.A.M.C.; Capt. P. B. Lander, R.A.M.C.; Capt. J. J. D. La Touche, R.A.M.C., Spec. Res.; Temp. Maj. acting Lt.-Col.) T. M. R. Leonard, Gen. List, W. Afr. M.S.; Capt. W. M. Lupton, I.M.S.; Maj. W. S. McGillivray, I.M.S.; Temp. Capt. D. McIntyre, R.A.M.C.; Capt. (acting Maj.) W. A. MacLennan, R.A.M.C., Spec. Res.; Maj. (temp. Lt.-Col.) A. McMunn, R.A.M.C.; Temp. Maj. R. T. Meadows, D.S.O., R.A.M.C. (late Surg.-Maj., A. Med. Res. of Off.); Capt. (temp. Maj.) W. D. Miller, S. Afr. M.C.; Capt. W. Mitchell, R.A.M.C.; Temp. Capt. A. J. R. O'Brien, M.C., Spec. List, W. Afr. M.S.; Lt.-Col. C. J. O'Gorman, D.S.O., R.A.M.C.; Maj. H. B. Owen, Uganda M.S. (temp. Capt., Spec. List); Temp. Maj. W. Owen-Pritchard, E. Afr. M.S.; Temp. Lt. S. A. Paymaster, I.M.S.; Lt.-Col. S. E. Prall, I.M.S.; Temp. Capt. A. F. H. Ratagliati, S. Afr. M.C.; Maj. J. H. Reford, Uganda M.S.; Capt. G. M. Roberts, R.A.M.C.; Capt. M. J. Roche, I.M.S.; Temp. Capt. T. R. Sandeman, Spec. List, W. Afr. M.S.; Capt. J. O. Shircore, E. Afr. M.S.; Maj. (temp. Lt.-Col.) C. G. Seymour, I.M.S.; Capt. R. G. Smith, S. Afr. M.C.; Maj. C. E. Southon, I.M.S.; Lt.-Col. T. Smythe, S. Afr. M.C.; Surg. (acting Staff-Surg.) C. G. Sprague, R.N.; Lt.-Col. (temp. Col.) G. W. Tate, D.S.O., R.A.M.C.; Maj. D. M. Tomory, S. Afr. M.C.; Capt. B. Varvill, R.A.M.C.; Capt. R. S. Walls, Spec. Res., R.A.M.C.; Temp. Capt. A. McP. Warner, R.A.M.C.; Temp. Capt. A. M. Webber, R.A.M.C.; Maj. P. St. J. Wilkinson, S. Afr. M.C.; Temp. Maj. A. D. J. D. Williams, E. Afr. M.S.; Temp. Capt. C. J. Wilson, E. Afr. M.S.

And the following in a despatch dealing with the operations of the Mesopotamia Expeditionary Force:—

Army Medical Service.—Col. (temp. Surg.-Gen.) A. P. Blenkinsopp, C.B.

Indian Medical Service.—Maj. (temp. Lt.-Col.) W. H. Hamilton, D.S.O.; Lt. J. B. de W. Molony.

Royal Army Medical Corps.—Temp. Capt. R. C. Begg; Capt. W. H. Biggs (T.F.); Lt.-Col. J. H. R. Bond, D.S.O.; Capt. T. K. Boney, Spec. Res.; Capt. A. E. Bonham (T.F.); Temp. Lt. D. F. Borrie; Temp. Capt. T. P. Buist; Maj. (acting Lt.-Col.) G. E. Cathcart; Capt. J. W. Dalgish, Spec. Res.; Temp. Maj. (temp. Lt.-Col.) R. Davies-Colley; Temp. Lt. G. Dougan; Capt. W. Dunlop, Spec. Res.; Lt. J. Ewing; Bt. Col. M. H. G. Fell, C.M.G.; Capt. M. Foster, Spec. Res.; Lt.-Col. (temp. Col.) S. F. St. D. Green; Capt. D. R. Hennessy, Spec. Res.; Capt. T. P. Inglis, Spec. Res.; Capt. C. M. Ingoldby; Temp. Capt. T. S. Keith, late R. W. Surr. R.; Capt. J. de M. Kneebone, Spec. Res.; Temp. Lt. A. C. Lambert; Capt. J. W. MacLean; Capt. and Bt. Maj. W. McNaughton; Temp. Capt. G. S. Marshall; Capt. J. P. Mitchell, Spec. Res.; Capt. W. K. Morrison, D.S.O.; Temp. Capt. V. E. Negus; Temp. Capt. C. J. B. Pasley; Temp. Capt. A. Poole; Temp. Capt. K. N. Purkis; Lt. (temp. Capt.) H. P. Rudolf; Bt. Lt.-Col. D. S. Skelton, D.S.O.; Bt. Col. J. M. Sloan, C.M.G., D.S.O.; Capt. G. N. Smyth, Spec. Res.; Temp. Capt. R. Y. Stones; Temp. Capt. G. S. Terry; Maj. (acting Lt.-Col.) J. F. Whelan; Lt.-Col. W. A. Woodside, D.S.O.

Medical Services.—Capt. C. H. P. Allen; Maj. (temp. Lt.-Col.) R. M. Barron; Maj. R. J. Bradley; Maj. (acting Lt.-Col.) E. W. Browne; Maj. (temp. Lt.-Col.) F. P. Connor; Capt. M. Das Lt.-Col. F. W. Gee; Capt. P. K. Gilroy; Bt. Lt.-Col. C. M. Goodbody, D.S.O.; Maj. (acting Lt.-Col.) C. A. Gourlay; Lt. W. P. Hogg; Capt. G. G. James; Capt. D. D. Kamat; Lt.-Col. T. B. Kelly; Maj. R. Kelsall, D.S.O.; Maj. (acting Lt.-Col.) J. C. H. Leicester; Maj. W. H. Leonard; Maj. (acting Lt.-Col.) W. Lethbridge; Capt. R. F. D. MacGregor, M.C.; Capt. A. A. C. McNeill; Capt. W. A. Mearns; Lt.-Col. F. O. N. Mell, C.I.E.; Maj. T. G. F. Paterson, D.S.O.; Capt. J. A. S. Phillips; Maj. E. A. Roberts; Capt. A. L. Sheppard; Capt. J. MacG. Skinner; Capt. W. D. H. Stevenson; Capt. W. E. R. Williams.

The names of the following medical officers have been brought to the notice of the Secretary of State for War for valuable services rendered in connexion with the war. All are members of the R.A.M.C. unless otherwise stated:—

Temp. Capt. R. M. Beaton; Temp. Maj. O. Challis; Temp. Capt. O. C. M. Davis; Temp. Maj. J. A. Devine, D.S.O.; Temp. Capt. W. V. Eaves; Capt. (acting Maj.) H. F. Everett (T.F.); Maj. F. G. Faichnie; Temp. Capt. W. T. Finlayson; Capt. A. G. R. Foulerton; Capt. C. C. Frye, F.I.C. (T.F.); Lt.-Col. J. B. Gibbons, late I.M.S.; Lt. (temp. Capt.) W. Gilliatt (T.F.); Maj. A. M. H. Gray (T.F.); Temp. Maj. W. E. Home; Temp. Capt. S. Infield; Temp. Capt. J. Keenan; Temp. Maj. T. M. Kendall; Lt. (Temp. Capt.) J. P. Kinloch (T.F.); Capt. and Bt. Maj. R. W. D. Leslie; Maj. H. H. Littlejohn (T.F.); Temp. Capt. G. Marshall; Lt.-Col. C. Milne, I.M.S.; Maj. G. H. Rees; Temp. Maj. A. W. Robertson; Capt. J. B. Stevenson, M.C.; Temp. Lt. R. Taylor; Col. J. Thomson, C.B., late R.A.M.C.; Maj. F. C. Whitmore (T.F.); Temp. Capt. D. Wilson; Maj. Sir E. S. Worthington, C.M.G., M.V.O.; Temp. Maj. (acting Lt.-Col.) W. P. Yetts.

Union of South Africa.—Temp. Maj. J. C. A. Rigby, S. Afr. M.C.

Commonwealth of Australia (*Australian Army Medical Corps*).—Maj. L. O. Betts; Maj. A. E. Colvin, M.C.; Hon. Lt.-Col. E. W. Hayward; Hon. Maj. A. Hordern; Surg.-Gen. Sir N. R. Howse, V.C., K.C.B.; Maj. H. B. Lewers, D.S.O.; Col. H. C. Maudsley, C.M.G.

Dominion of Canada (*Canadian Army Medical Corps*).—Maj. (acting Lt.-Col.) F. C. Bell; Col. J. W. Bridges; Lt.-Col. C. G. Bryan; Maj. F. S. Burke; Lt.-Col. H. R. Casgrain; Lt.-Col. G. Chambers; Col. H. A. Chisholm; Lt.-Col. J. T. Clarke; Maj. G. M. Davis; Surg.-Gen. G. la F. Foster; Maj. J. C. Fyshe; Maj. W. L. Hutton; Maj. H. B. Jeffs; Lt.-Col. W. T. M. Mackinnon; Maj. S. H. McCoy; Maj. (acting Lt.-Col.) J. C. Meakins; Lt.-Col. F. H. Mewburn; Col. A. Primrose; Capt. C. W. Waldron; Capt. A. W. Wakefield.

Gibraltar.—Lt.-Col. G. Dansey-Browning; Temp. Capt. E. V. Hunter; Temp. Capt. (local Maj.) C. G. H. Moore.

Jamaica.—Lt.-Col. J. H. A. Rhodes.

Jersey.—Temp. Maj. A. C. Stamberg (Surg.-Gen., R. Jersey Mila.).

Malta.—Capt. (temp. local Maj.) J. A. Arkwright; Capt. (local Maj.) G. R. Bruce, Spec. Res.; Maj. J. C. G. Carmichael; Maj. (local Lt.-Col.) C. H. Carr; Temp. Maj. G. Graham; Temp. Capt. G. Hamilton; Temp. Maj. T. Mackenzie; Capt. (temp. local Maj.) C. R. Nicholson; Maj. (temp. local Lt.-Col.) A. C. O'Sullivan; Capt. A. Patrick; Capt. (temp. local Maj.) H. J. Pickering; Capt. (temp. local Maj.) C. H. G. Prance; Capt. (temp. local Maj.) A. B. W. Rust; Capt. (temp. local Maj.) H. H. Serpell; Temp. Capt. (local Maj.) E. G. B. Starkie.

Mauritius.—Capt. F. W. Hay, I.M.S.; Lt.-Col. D. Lawson.

Dominion of New Zealand (*New Zealand Medical Corps*).—Capt. C. G. Alckin; Maj. H. F. Bernau; Capt. (temp. Maj.) F. T. Bowerbank; Capt. (temp. Maj.) W. Bruce; Capt. (temp. Maj.) R. H. Hogg; Capt. (temp. Maj.) T. McKibbin; Lt.-Col. C. H. Tewsley; Capt. (temp. Maj.) W. H. Unwin.

FOREIGN DECORATIONS.

Belgian.

Croix de Guerre.—Lt.-Col. (temp. Col.) J. D. Alexander, D.S.O., R.A.M.C.; Lt.-Col. A. Chopping, C.M.G., R.A.M.C.; Temp. Capt. M. Coplans, D.S.O., R.A.M.C.; Capt. T. F. Corkill, R.A.M.C. (Spec. Res.); Bt. Col. S. L. Cummins, C.M.G., R.A.M.C.; Temp. Capt. J. H. H. Pearson, R.A.M.C.; Surg.-Gen. R. Porter, C.B.; Surg.-Gen. Sir A. T. Sloggett, K.C.B., K.C.M.G., K.C.V.O., K.H.S.; Maj. H. Stedman, late R.A.M.C.

CENTRAL SURGERIES.

AN interesting report was made to the Central Medical War Committee, at the meeting on Wednesday last, on the results of an inquiry made into the working of the widely differing groups of central surgeries which have come into existence since the war. Only six centres—namely, those at Edinburgh, Dundee, Aberdeen, Nottingham, Birmingham, and Hertford—were made the subject of investigation, and, presumably, those are the only centres where anything like public organisation has taken place, but there must be many other localities in which groups of medical men have combined to save time and expense—for their patients as well

as for themselves—in dealing with medical practice in the absence of doctors employed on naval or military duties.

The clientèle at the six centres was found to differ widely in numbers and to some extent in constitution, although the majority of these schemes had been constructed for dealing with panel patients, the convenience being as much on the side of the patients as on the side of the doctors; for the schemes have all been directed towards the attention of the sick with promptitude, domiciliary treatment, when required, being supplied by men residing in the vicinity of the patients.

To these six centres categorical questions were issued as to the inception and scope of each scheme, its organisation, financial arrangements, its results (as far as experience has yet gone) and the hardships, if any, which have been entailed by it (1) upon the practitioners who are working the scheme, (2) upon the absentee doctors whose interests the scheme is largely designed to promote, and (3) upon the patients, whether on a panel or a private list. A further question was added inquiring how far the scheme retained for the absentee medical practitioners their interest in their private patients. The answers showed that there was great diversity between the schemes on every ground. At Dundee, for example, a scheme came into force within the first few days of the war, while the birthday of the Edinburgh scheme was in last July. Again, in Aberdeen the total panel list is being dealt with; 6500 patients form the list in Birmingham, 10,000 that in Nottingham, and only half-a-dozen individual lists are under consideration in Hertford. In Nottingham the scheme evolved from a private arrangement between doctors on service and their colleagues; the other schemes are due to the activities of the local Medical War Committee, of panel committees, or of committees specially convened to take charge of the organisation.

A centre for consultation, with accommodation and staff proportional to the amount of work to be dealt with, is necessarily common to all the plans, but in Birmingham a whole-time medical officer over military age is employed and is responsible for the clerical work, while in Hertford, with only one absentee medical man's interests to be cared for, the work has not been found to require a clerk.

Attendance at the central surgery by rota varies, as far as calls upon the individual medical men's time, by the number of doctors engaged; the attendances of the individual doctors in Nottingham, for example, amount to nine hours a week each for three practitioners dealing with their own work and that of four absentees, while in Edinburgh the time required of each doctor is only one hour in nine or ten days. It should be added that no dispensing or midwifery is undertaken except in Hertford, where the dispenser of the local hospital can be made use of. On such a system of rota complications must arise in attempting to ensure that a patient is seen throughout one illness by the same doctor, though a careful system of record removes much of the difficulty.

The financial arrangements differ so much that no common conclusions can be drawn. At Hertford the board of the hospital defrays expenses from the money received from dispensing, and there is no charge for clerical work. In Birmingham the salary of a whole-time medical officer has to be found. In Dundee the absentee's remuneration is a first charge on the pool, and in Edinburgh the share of the absentee's expenses is made a first charge on his panel cheque. The proportion of private and panel fees payable to the doctors varies, but the general object has always been to obtain for the absentee at least 40 per cent. of his panel cheque. From the general conclusions in the report we learn that under these central surgeries economy is secured and that a number of practitioners are set free to accept commissions, but as regards private practice it appears to be accepted that the schemes have failed, though their failure may be only relative. It seems likely that private patients are in general averse from the adoption as yet of a centralising system, but as its merits appear this opinion should change.

THE CORNWALL WAR MEMORIAL.—The Tehidy Sanatorium for Tuberculosis will be formally handed over to the Cornwall County Council on April 3rd. It is hoped to raise £18,000 for the scheme; £14,400 have been already received, and as the subscription list will be opened until the end of July it is expected that the required amount will be obtained.

Medical News.

HONORARY DEGREES AT OXFORD.—The degree of D.Sc., *honoris causa*, was conferred upon W. C. M'Intosh, M.D. Edin., late Professor of Natural History in the University of St. Andrews; and the degree of M.A., *honoris causa*, upon R. H. Anglin Whitelocke, M.D. Edin., at a Convocation held at Oxford on March 12th.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—An ordinary meeting of the Council was held on March 14th, Colonel Charters Symonds, the Senior Vice-President, being in the chair.—It was resolved, in accordance with the report of the Board of Examiners in Dental Surgery, to grant Diplomas of the Licence in Dental Surgery to the following successful candidates:—

Arthur John Cairns, London Hospital; Edward Honoré Clarence Caute, Middlesex and Royal Dental Hospitals; Alwyn Norman Goudge, Guy's Hospital; Wallace Duncan Hatton, Guy's Hospital; William Trevor Johnson, Birmingham University; Ernest Albert Nunn, Middlesex Hospital; Richard Stanislaus Roche, Guy's Hospital; William Holder Shipway, L.D.S. Bristol, Bristol University; and Stanley Carlyle Turner, Guy's Hospital.

It was resolved, on the recommendation of the Board of Examiners in Dental Surgery, to hold the examinations for the First and Second Parts of the Licence in Dental Surgery only twice a year—namely, in May and November.—It was resolved to appoint Dr. W. S. A. Griffith as the representative of the College on the Central Midwives Board for one year from March 31st, 1918, and the best thanks of the Council were given to him for his services on the Board during the past year.

ROYAL COLLEGE OF SURGEONS OF EDINBURGH.—At the recent Dental Examination, just concluded, the following candidates passed the First Dental Examination:—

Herbert Daniel Howard and Cecil Aubrey Castles.

The following passed in the subject of Chemistry and Physics:—

James Gordon Mackintosh, Ernest Sankey, Nathan Israel, Johannes Vlok Basson, Margaret Peterkin, and Willem Frederik Pauw.

At the same diet the following candidates passed the Final Examination and were granted the Diploma L.D.S., R.C.S. Edin.:—

Alexander Brunton Wallace, Edinburgh; James Sylver Butchart, Leith; Alfred McCambley, Belfast; and Daniel Andries Marchand, South Africa.

ROYAL COLLEGE OF PHYSICIANS OF IRELAND.—At a special meeting of the President and Fellows of the Royal College of Physicians of Ireland held on March 15th Dr. George Sigerson was admitted by the President as an Honorary Fellow of the College. At the conclusion of the ceremony Dr. J. F. O'Carroll, President of the College, entertained the company to tea in the College Hall.

KING EDWARD'S HOSPITAL FUND FOR LONDON.—We are asked to state that hospitals in the County of London or within nine miles of Charing Cross desiring to participate in the grants made by this Fund for the year 1918 must make application before March 31st to the honorary secretaries, 7, Walbrook, E.C. 4. Applications will also be considered from convalescent homes which are situated within the above boundaries, or which, being situated outside, take a large proportion of patients from London. Applications will also be considered from sanatoria for consumption which take patients from London or which are prepared to place beds at the disposal of the Fund for the use of patients from London hospitals.

A CONSERVATIVE AND UNIONIST ASSOCIATION FOR THE COMBINED UNIVERSITIES.—At a meeting of graduates of the Universities of Durham, Manchester, Liverpool, Leeds, Sheffield, Birmingham, and Bristol held in London on March 12th, it was decided to form a Conservative and Unionist Association for the new university constituency, which comprises the universities at these centres. It is the object of the association to do all in its power to further the interests of education, and in particular of higher education, while, at the same time, giving support to those fundamental political principles denoted by its title. A provisional committee including the following officers was appointed:—Sir Maurice Abbot-Anderson, chairman; Professor J. Wemyss Anderson, honorary treasurer; and Mr. Herbert G. Williams, honorary secretary, 130, Ashley Gardens, London, S.W. 1. It is proposed to fill the office of vice chairman by the appointment of a woman graduate. As no complete list of addresses is available, the honorary secretary asks all graduates of the seven universities, who approve of the action taken, to communicate with him stating their university and degree.

THE Wellcome Historical Medical Museum will be closed for cleaning from April 1st to 30th, inclusive.

AT a meeting of the West London Medico-Chirurgical Society to be held at the West London Hospital on April 5th, at 8.30 P.M., Dr. Robert Hutchison will read a paper on "The Medical Aspects of the Food Problem."

Miss Margaret B. Dobson, M.D. Lond., oculist at the Ealing and Bromley School Clinics, has left for Egypt, at the request of the War Office, to undertake work as an eye specialist. Mrs. Sophie Grace Banham, M.B., B.Sc. Lond., ophthalmic medical officer to the Acton Education Committee, will carry on the work at Ealing.

LONDON TEMPERANCE HOSPITAL.—The annual public meeting of the London Temperance Hospital (Hampstead-road, N.W.) will be held in the Out-patient Hall on Wednesday next, March 27th, at 5 P.M., when Dr. J. Porter Parkinson and Mr. Arthur Evans, amongst others, will give addresses.

ROYAL PORTSMOUTH HOSPITAL.—The report of this institution for the year 1917 states that 1767 civilian in-patients and 1149 military in-patients have been treated during the year. The daily average number of beds occupied was 190, as compared with 160 in 1916, and the average cost per bed occupied was £66 0*s.* 7*d.*, as compared with £71 11*s.* 5*d.* in 1916. The causes at work have been mainly a large increase in the number of beds occupied by military patients, for whom doctors and nurses are provided and paid by the military authorities. Repairs not absolutely necessary have been waived, and a more economical dietary provided for the staff. The ordinary income amounted to £13,678 and the expenditure to £13,644, both record sums in the history of the hospital, leaving a margin of £35 without touching the legacies, which amounted to £1605. The patients treated in the venereal department (the first in the country approved by the Local Government Board) numbered 559, and if the results already obtained are confirmed by further experience there seems good ground for believing that this new departure will confer a lasting benefit upon the community.

ABERDEEN DISPENSARY AND MATERNITY HOSPITAL.—The report of the Aberdeen Dispensary for 1917 states that during the year 4801 cases were treated, a decrease of 52 on 1916; 779 patients were treated in their homes, a decrease of 115 on the previous year; and 1994 visits were paid to patients, a decrease of 445. There was also a slight decrease in the vaccinations, but in the dental operations and the special ear, nose, and throat cases there was an increase on 1916. With regard to vaccinations, many of the mothers have objections to the four-mark vaccination, and the report suggests—

That if the Local Government Board could be induced to allow the number of marks to be reduced to two, at the same time insisting that the area to be covered by these shall be equal to the area that would be covered by four marks, the work of the institution in this department would in all likelihood be increased and a far greater degree of safety would be attained than by allowing cases to go outside and have only one mark put on—a practice which, if the safety of the community is to be considered at all, requires to be looked after.

The total ordinary income for the year was £1018 and the total expenditure was £837.

THE EXTENSION OF THE NATIONAL INSURANCE MEDICAL BENEFITS TO IRELAND.—A general meeting of members of the medical profession is to be called in Dublin by the Irish Medical Association and the Irish Committee of the British Medical Association to consider the extending of medical benefits under the Insurance Act to Ireland and to review the unsatisfactory condition of the medical profession generally, but chiefly in relation to boards of guardians and the difficulty of obtaining from these boards consideration of the claims of Poor-law medical officers, whose remuneration remains stationary in spite of the greatly increased cost of living. Dr. E. C. Thompson (surgeon to the County Tyrone Infirmary, Omagh) presided at a meeting of the Tyrone doctors in Omagh, on March 12th, in which, after an interesting debate, some of the speakers urged a general strike of the medical profession if their claims to reasonable remuneration were passed over. But it was finally decided, inasmuch as the conditions in each district were so variable, that a sectional strike might be more advisable, and a resolution to that effect was passed. It was also agreed that medical benefits should be extended to Ireland, and five Tyrone doctors were appointed as delegates to the central conference. A resolution was carried heartily supporting the action of the medical officers of the Enniskillen union (co. Fermanagh) in striking. On March 11th the co. Derry medical men met in Coleraine, when resolutions were unanimously adopted demanding a rise in the salaries of dispensary medical officers, payment of £1 1*s.* per diem for locum tenents or emergency workers, fees for visits and mileage under the tuberculosis section of the Act and for medical examinations, and superannuation pay on civil service rates. Five delegates were appointed to the Dublin meeting of the medical profession of Ireland.

THE SERVICES.

ROYAL NAVAL MEDICAL SERVICE.

ROYAL NAVAL VOLUNTEER RESERVE.

To be temporary Dental Surgeons: W. M. Bull, H. M. Marshall.

ARMY MEDICAL SERVICE.

Surg.-Gen. R. Porter, C.B., is placed on retired pay.

The undermentioned Lieutenant-Colonels, from R.A.M.C., to be Colonels: T. H. M Clarke, C.M.G., D.S.O.; (Temp. Col.) S. L. Cummins, C.M.G., (Temp Col.) J. Poe, D.S.O.

Col. E. G. Browne, C.B., C.M.G., to be temporary Major-General.

Temp. Hon. Col. J. F. O'Carroll to be temporary Colonel.

TERRITORIAL FORCE.

Lieut.-Col. D. Smart to be Assistant Director of Medical Services and to be temporary Colonel whilst so employed.

ROYAL ARMY MEDICAL CORPS.

Majors to be Lieutenant-Colonels: J. T. Johnson, D.S.O., (Temp. Lieut.-Col.) W. R. P. Goodwin, D.S.O., (Acting Lieut.-Col.) W. L. Steele, (Acting Lieut.-Col.) W. Riach, C.M.G.

Major E. T. Potts, D.S.O., to be temporary Lieutenant-Colonel whilst employed as Assistant Director of Medical Services of an Army.

Major H. H. J. Fawcett, O.B.O., retains the acting rank of Lieutenant-Colonel whilst in command of a Casualty Clearing Station.

To be acting Lieutenant-Colonels whilst in command of a Medical Unit: Capt. R. M. Davies, Major C. Bramhall, Major J. M. M. Crawford.

W. F. Thompson to be temporary Captain whilst employed at County of Middlesex War Hospital.

To be temporary Captains: W. V. Coffyn, F. J. McGlade, J. McGrath.

Temporary Captains to be honorary Captains: C. E. Lea, W. G. Porter, E. C. E. Van-Eyck.

To be temporary Lieutenants: J. Raffan, E. H. Roberts, W. P. Philip, T. McLaren, C. I. Ilderton J. W. Robertson, C. M. Bradley, C. Fletcher, E. J. Blewitt, H. E. Kitchen, D. E. Young, R. J. Bassett, P. M. Roberts, D. B. Leitch, H. G. G. Nelson, H. C. Attwood, M. M. Munden, C. W. W. James, E. G. Pringle, P. C. Phillips, G. R. Halloran.

Officers relinquishing their commissions: Temp. Capts. R. M. Fraser, W. G. Jones, A. H Parkinson, H. W. Wilson, J. G. Leslie, H. McW. Daniels R. Condy, W. J. Hogg (on taking up duty under Ministry of National Service), E. Rommel, C. G. Todd (on account of ill-health contracted on active service); Temp. Lieut. F. R. Smyth.

Canadian Army Medical Corps.

Temp. Major A. S. Donaldson to be acting Lieutenant-Colonel and to command a Field Ambulance.

Temp. Capt. (acting Major) T. H. Bell, M.C., to be temporary Major.

Temp. Major G. C. Lawson reverts to the temporary rank of Captain.

Temp. Capt. W. T. Ewing to be acting Major.

SPECIAL RESERVE OF OFFICERS.

Lieutenants to be Captains: G. S. Wilson, J. W. Gordon, A. A. Fitch, A. A. Pritchard, G. M. Herriot, J. B. Mudge, T. P. Williams, G. V. Davies, H. A. G. Dykes W. F. Mason.

To be Lieutenants: H. E. Rhodes, G. E. MacAlevey, I. H. Zortman, and C. S. Parker (from University of London Contingent, O.T.C.); R. B. Britton (from Bristol University Contingent, O.T.C.).

TERRITORIAL FORCE.

Lieut.-Col. (temp. Col.) D. Smart and Lieut.-Col. (temp. Col.) A. R. Tweedie relinquish their temporary rank on vacating their appointments as Assistant Directors of Medical Services, and are restored to the establishment.

Major (acting Lieut.-Col.) H. E. Corbin relinquishes his acting rank on ceasing to command a Field Ambulance.

Lieut.-Col. (temp. Col.) H. G. Falkner relinquishes his temporary rank on vacating an appointment as Assistant Director of Medical Services.

Capt. (acting Lieut.-Col.) O. L. Apoleton reverts to the acting rank of Major, with pay and allowances of a Captain.

Major (temp. Lieut.-Col.) E. C. Montgomery-Smith, D.S.O., is seconded whilst holding an appointment as Assistant Director of Medical Services and to be temporary Colonel whilst so employed.

Major R. T. Hughes to be acting Lieutenant-Colonel whilst commanding a Casualty Clearing Station.

Major (acting Lieut.-Col.) R. Stirling relinquishes his acting rank on ceasing to command a Casualty Clearing Station.

Major J. A. Masters is retired, and is granted permission to retain his rank and to wear the prescribed uniform.

Capt. G. B. Robinson to be Major.

Capt. P. G Phillips and Capt. E. Whichello relinquish their commissions on account of ill-health, and are granted the hon. rank of Captain.

Capt. E. R. Cooper resigns his commission on account of ill-health contracted on active service, and is granted the honorary rank of Captain.

Capt. (temp. Major) A. Mowat relinquishes his temporary rank on an alteration in posting.

Capt. J. A. Nixon to remain seconded whilst holding a temporary commission in the Army Medical Service.

Capt. H. F. Wilkin, M.C. to be acting Lieutenant-Colonel whilst commanding a Field Ambulance.

Capt. S. F. St. J. Steadman and Capt. J. M. McQueen are seconded.

J. Whiteside to be temp. Lieutenant, East Yorkshire Volunteer Corps.

H Wales to be Medical Officer, 1st Battalion, East Yorkshire Regt.

Medical Officer and Temp. Capt. W. Gripper, from 9th Batt. Surrey Volunteer Regt., to be temp. Captain, Surrey Medical Volunteer Corps.

S. Sills to be temporary Lieutenant, Kent Medical Volunteer Corps.

J. G. Miller (late Captain, R.A.M.C. (T.F.)) to be Medical Officer and temporary Captain, 4th Battalion, Northumberland Volunteer Regt.

DEATHS IN THE SERVICES.

Inspector-General Michael Fitzgerald, C.M.G., R.N., at his residence, Roughan, near Ennis, on March 13th. He was surgeon in charge of H.M.S. *Magpie* in 1874 in the disturbances at Masnah, Persian Gulf, and in 1882 he served at Malta during the Egyptian operations. On both occasions he received the thanks of the Admiralty, and for his work with the forces of Admiral Rawson in the punitive naval expedition against the King of Benin in 1897 he received the C.M.G. He retired in 1905.

Parliamentary Intelligence.

NOTES ON CURRENT TOPICS.

Maternity and Child Welfare Bill.

Mr. HAYES FISHER, President of the Local Government Board, introduced in the House of Commons on Thursday, March 14th, the Maternity and Child Welfare Bill. Its object is "to make further provision for the health of mothers and young children." It was read a first time.

The text of the Maternity and Child Welfare Bill has been published. Clause 1 deals with the powers of local authorities with respect to maternity and child welfare. It is as follows:—

1. Any local authority to which this Act applies may make such arrangements as may be sanctioned by the Local Government Board for attending to the health of expectant mothers and nursing mothers and of children who have not attained the age of five years and are not being educated in schools recognised by the Board of Education: Provided that nothing in this Act shall authorise the establishment by any local authority of a general domiciliary service by medical practitioners.

2. This Act applies to the following local authorities in England and Wales—that is to say, the council of any county or county borough, the common council of the City of London, the council of any metropolitan borough, and the council of any borough or urban district having a population of over twenty thousand: Provided that if in any case after consultation with the council of any county the Local Government Board are satisfied as respects any county district in the county that any such arrangements as aforesaid (whether actual or prospective) can more efficiently be made by any district council not being a local authority to which this Act applies the Board may, subject to such conditions as they think fit, sanction the making of such arrangements by the district council, and the district council may make such arrangements accordingly.

Clause 2 (maternity and child welfare committees) runs thus:—

1. Every council in England and Wales exercising powers under this Act or under Section 2 of the Notification of Births (Extension) Act, 1915, shall establish a maternity and child welfare committee, and all matters relating to the exercise of the powers of the council under this Act or under the Notification of Births (Extension) Act, 1915 (except the power of raising a rate or of borrowing money), shall stand referred to such committee, and the council, before exercising any such powers, shall, unless in their opinion the matter is urgent, receive and consider the report of the maternity and child welfare committee with respect to the matter in question, and the council may also delegate to the maternity and child welfare committee with or without restrictions or conditions as they think fit, any of their powers under that Act or this Act, except the power of raising a rate or of borrowing money.

2. Not less than two-thirds of the members of every maternity and child welfare committee shall consist of members of the council, but the council shall also appoint as members of the committee persons specially qualified by training or experience in subjects relating to health and maternity who are not members of the council. Maternity and child welfare committees shall include women and members of the Insurance Committees concerned.

3. The committee established under this section shall take the place of any committee appointed under Subsection (2) of Section 2 of the Notification of Births (Extension) Act, 1915, and the provisions of that subsection relating to the exercise of powers by a committee shall cease to have effect.

Clause 3 (expenses) runs:—

The expenses of any council in England and Wales under this Act shall be defrayed in the same manner as expenses under the Notification of Births Acts, 1907 and 1915: Provided that a county council may, if they think fit, charge all expenses under this Act or those Acts as general county expenses subject to the condition that if any district council within the county has provided for its district a similar service to that provided by the county council for other parts of the county the county council shall pay to the district council the amount raised by them in the district in respect of such service.

Clause 4 reads:—

Section 3 of the Notification of Births (Extension) Act, 1915, shall be read as if the following words were inserted at the end of paragraph (*b*) of Subsection (1) and paragraph (*b*) of Subsection (2) thereof—namely: "and for the purpose of any such arrangements may, subject to the sanction aforesaid, exercise the like powers as they are entitled to exercise for the purpose of the provision of hospitals."

Clause 5 is in the following terms:—

1. This Act may be cited as the Maternity and Child Welfare Act, 1918.

2. This Act, except the section thereof providing for the amendment of Section 3 of the Notification of Births (Extension) Act, 1915, shall not apply to Scotland or Ireland.

HOUSE OF COMMONS.

WEDNESDAY, MARCH 13TH.

Soldiers Discharged for Tuberculosis.

Major D. DAVIES asked the Pensions Minister whether he could state how many men had been discharged from the Army on account of tuberculosis who had contracted this disease before they were passed for service by the Army medical boards; and whether he was prepared to forward this information to the Minister of National Service.—Mr. HODGE replied: I regret that neither the records kept by the Chelsea Commissioners before the formation of the Ministry nor those kept at the present time enable the information desired to be given.

Major DAVIES: Is the right honourable gentleman aware that the Ministry of National Service cancelled an Army Council instruction dealing with the admission of these men into the Army, and will he say what effect that has upon his own department?—Mr. HODGE: I am obliged to the honourable Member for the information which he has conveyed to me.

Mr. HOGGE: Is the right honourable gentleman not aware that these men are entitled under the National Insurance Act to tuberculosis treatment, and can he say how many soldiers discharged from camps are now receiving that treatment?—Mr. HODGE: I think my honourable friend must be conscious of the fact that he would have to put down a question if he desires information as to figures.

THURSDAY, MARCH 14TH.

Discharged Soldiers and Workmen's Compensation.

Sir GILBERT PARKER asked the Home Secretary whether employers of labour who gave work during the war to discharged soldiers who were physically deficient had any concessions made to them in regard to their liabilities under the Workmen's Compensation Act.—Sir G. CAVE replied: I have appointed a committee to consider this matter. The committee is now proceeding with its inquiry.

Small-pox in the East-End of London.

Mr. ANDERSON asked the Parliamentary Secretary to the Local Government Board whether he could give particulars of the outbreak of small-pox in the East-End of London; the districts from which cases had been reported and the number of cases so reported; what steps had been taken; and with what result.—Mr. STEPHEN WALSH answered: Ten cases of small-pox were notified between March 2nd and March 7th in Stepney, Hackney, Bethnal Green, and East Ham. The cases were removed to hospital, the houses were disinfected, all human contacts are under observation, and all who could be persuaded were vaccinated. It is reported this morning that seven further cases have occurred in Stepney amongst the contacts and have been removed to hospital.

Mr. PETO: Do the Government propose, in view of this emergency, to ask for any powers to enforce compulsory vaccination in certain districts now?—No reply was given.

Children's Food Rations.

Colonel G. COLLINS asked the Parliamentary Secretary to the Ministry of Food whether his attention had been drawn to the new food regulation which limits the meat ration to children under 12 years of age to half the adult ration; was he aware of the medical and educational opinion which was expressed against this regulation; and would he consider cancelling the regulation.—Mr. CLYNES replied: Children of ten years and upwards are entitled to full meat rations. I am aware that the restriction presses hardly on children just below the dividing line, especially those in educational establishments, and I will consider how far it will be possible to grant supplementary rations in these cases after the claims of those engaged on heavy physical work have been satisfied.

Hospital Treatment of Poor Persons in Ireland.

Mr. P. MEEHAN asked the Chief Secretary for Ireland whether he would consider the advisability of immediately introducing a Bill to amend Section 7 of 25 and 26 Vic., cap. 83, so as to empower boards of guardians, on the recommendation of a medical officer, to send poor persons, whether inmates of the workhouse or otherwise, to an extern hospital for special treatment.—Mr. DUKE answered: The representations which have been received as to the necessity for such an amendment of the law are being considered.

MONDAY, MARCH 18TH.

Medical Care of the Air Force.

Major D. DAVIES asked the Under Secretary to the Air Ministry whether he could state how far the arrangements for the medical care of the air service had been proceeded with, and what steps he intended to take to expedite the transference of Royal Army Medical Corps officers previously attached to the Royal Flying Corps to the Air Force so as to be under the direct control and administration of the Medical Administrator of the Air Council in this country.—Major BAIRD replied: The answer to the first part of the question is that the Medical Administrative Committee has met and has come to a number of decisions which are now being dealt with by the Air Council. The answer to the second part of the question is that the officers referred to will, in the first instance, be lent to the Air Force and will be under the direct control of the Medical Administrator. When the conditions of service for medical officers who are to be seconded to the Air Force have been decided those officers who are considered suitable will be seconded to the Air Force.

TUESDAY, MARCH 19TH.

The Inquiry into Medical Services.

Major D. DAVIES asked the Under Secretary for War whether he had now received the report of the Army Council on the Committee of Inquiry into the Medical Services in France.—Mr. MACPHERSON replied: The report has just been received from France, and it is being considered.

Abandoned Hospital for Venereal Disease.

Answering Captain SHEEHAN, who asked whether the proposal for converting the military barracks at Buttevant, co. Cork, into a hospital for the treatment of venereal disease had been dropped, Mr. MACPHERSON said: Yes, sir, it has been decided to abandon this proposal.

Maisons Tolérées in France.

Answering Mr. LEES SMITH, who asked whether he had any statement to make with regard to the proposal that the *maisons tolérées* in France should be placed out of bounds for British troops, Mr. MACPHERSON said: It has been decided, with the permission of our Allies, to place these houses out of bounds in France. I do not intend to take any notice of the unscrupulous attacks made upon myself either personally or as the mouthpiece of my department—attacks based upon the dishonourable process of extracting an isolated sentence from an argument and making a conditional sentence absolute, but I should like to remind the House that it was not the British military authorities, as has been asserted, who established these houses or who provided the women in them, nor can I find, as has been asserted, any justification for the statement that any part of the French civil population protested against any of these institutions established under their own laws; nor did our military authorities in France receive any such protest. While this step has been taken the House must not think that the very grave problem of venereal disease which confronts the military authorities in France has been disposed of. My military advisers have grave doubts that the contrary may be the effect. This question, which it must be remembered is not merely a military one but a great social and national one, will continue to be watched with anxiety by us.

Medical Aid for Soldiers' Widows.

Major D. DAVIES asked the Parliamentary Secretary to the Ministry of Pensions whether he could now state what steps he intended to take for the provision of medical aid for the widows and children of soldiers; and whether he was prepared to include the wives and children of soldiers who were now serving in the Army under the contemplated scheme.—Sir A. GRIFFITH-BOSCAWEN answered: The special arrangements which were at one time contemplated for providing medical aid to the widows and children of soldiers out of their pensions are not being adopted at the present time. Widows and wives of soldiers are entitled to medical attendance and treatment if they are employed contributors under the National Health Insurance Acts, and where such or similar entitlement does not exist, and there is pecuniary need, a recently extended regulation of the Special Grants Committee allows substantial grants extending over a considerable period in cases of serious illness of the wives, children, and dependants of serving soldiers and the widows and orphans of soldiers deceased.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

PATERSON, C. E., M.D. Edin., has been appointed Certifying Surgeon under the Factory and Workshop Acts for the Farnborough No. 1 District of the County of Hants.

PIGGOTT, FREDERICK STANLEY LAWRENCE, L.R.C.P. Lond., M.R.C.S., Honorary Medical Officer to the Teignmouth (Devon) Hospital.

RUSSELL, Miss VIOLET I., M.R.C.S., L.R.C.P., Assistant Resident Medical Officer to Queen Charlotte's Lying-in Hospital.

Vacancies.

For further information refer to the advertisement columns.

Barrow-in-Furness, North Lonsdale Hospital.—Sec. H.S. £250.
Birkenhead Borough Hospital.—Jun. H.S. £170.
Bolingbroke Hospital, S.W.—Jun. H.S. £150.
Bristol Royal Infirmary.—H.P. and H.S. £120.
Charing Cross Hospital.—H.P. and H.S. £100.
Coventry Education Committee.—Temp. Asst. School M.O. £350.
Cumberland, County of.—Temp. Asst. County M.O. £350.
Derby, Derbyshire Royal Infirmary.—H.P. and C.O. £200.
Derbyshire County Council.—Tuberculosis Officer. £500.
Devonport, Royal Albert Hospital.—Res. H.S. £200.
Downs Sanatorium, near Sutton, Surrey.—Med. Supt. £500.
Exeter City.—Asst. M.O.H. and Asst. School M.O. £350.
Glamorgan County Council.—Temp. M.O. £400
Guildford, Royal Surrey County Hospital.—H.S. £250.
Herts County Asylum, St. Albans.—Temp. M.O. 6 gs. wk.
Kensington Dispensary and Children's Hospital.—Res. M.O.
Leicester, Isolation Hospital and Sanatorium.—Res. M.O. £350.
Liverpool University Faculty of Medicine.—Sen. Dem. of Anat. £175.
Manchester Children's Hospital.—M.O. £200.
Manchester, City of.—Female M.O. £400.
Manchester Royal Infirmary.—Asst. Res. Surg. Officer. £200.
Nelley, Welsh Hospital.—M.O.
Newcastle-upon-Tyne Education Committee.—Asst. Sch. M.O. £350
Nottingham City Asylum.—Sec. Asst. M.O. £300.
Queen's Hospital for Children.—Res. M.O. £150. Also Surg. £25. Also Temp. Assist. P.
Rochdale Infirmary and Dispensary.—M.O.
St. Mark's Hospital for Cancer, Fistula, and other Diseases of the Rectum, City-road, E.C.—Temp. Asst. Surg.
Samaritan Free Hospital for Women.—Asst. Surg.
Sheffield Royal Infirmary.—H.S. £120.
South London Hospital for Women.—Female H.P. £100,
Stockport Infirmary.—Jun. H.S. £200.
Waltham-tow Urban District Council.—*Hospital for Infectious Diseases, Chingford.*—Res. M.O. £275.
Whitehaven and West Cumberland Infirmary.—Res. H.S. £150.
Wigan County Borough.—Asst. School M.O. & Tuberc. Officer. £400.
Willesden Urban District Council.—Temp. Dental Surg. £7 7*s.* per week.
Worcestershire Asylum, Barnsley Hall, Bromsgrove.—Temp. Asst. M.O.

THE Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Birstal, Yorks; at Clwtybont, Carnarvon; and at Wilton, Wilts.

Births, Marriages, and Deaths.

BIRTHS.

ADAMS.—On March 12th, at Onslow-road, Richmond, the wife of Captain M. M. Adams, S.A.M.C., of a son.

ATKINSON.—On March 13th, at Prince's-gate, the wife of Captain Christopher Atkinson, R.A.M.C., of a son.

MCCREERY.—On March 15th, at The Esplanade, Dover, the wife of Major A. T. J. McCreery, M.C., R.A.M.C., of a daughter.

MCVAIL.—At Calcutta, on March 6th, the wife of John Borland McVail, M.R.C.S., of a son.

WINDER.—On March 17th, at Clonmartle, Camberley, the wife of Brevet Lieutenant-Colonel M. G. Winder, D.S.O., R.A.M.C., of a son.

MARRIAGES.

ABEL—PATERSON.—On March 13th, at the Whetstone Congregational Church, Surgeon A. Lawrence Abel, R.N., to Margaret Russel Paterson, M.D. Lond.

BROWN—WEEKS.—On March 19th, at Bedlington, Lieutenant-Colonel William Brown, R.A.M.C. (T.), to Evelyn Mary, elder daughter of the late J. G. Weeks, J.P., and of Mrs. Weeks, Laird's House, Bedlington.

LOUDON—LEES.—On March 19th, at Gatley Parish Church, Lieutenant-Colonel A. W. B. Loudon, R.A.M.C. (T.), to Morag Margaret Black, third daughter of F. P. Lees, Gatley, Cheshire.

QUICK—HELLINS.—On March 16th, at Holy Trinity, Beckenham, by the Rev. W. Yorke Batley, M.C., Captain Hamilton E. Quick, M.B., B.S., B.Sc., F.R.C.S., R.A.M.C. (T.), son of Mr. and Mrs. C. H. Quick, of Swansea, to Adelaide Ruth, second daughter of H. H. Hellins, M.Inst.C.E., and of Mrs. Hellins, of Sydenham.

TANNER—HUMPHRIES.—On March 14th, at St. Margaret's, Plumstead, W. E. Tanner, M.S., F.R.C.S., Temporary Captain, R.A.M.C., to Marie Louise, daughter of Mr. and Mrs. Edwin Humphries, of Plumstead Common.

THOMSON—LAWRENCE-SMITH.—On March 14th, at Hurstpierpoint, Captain James R. K. Thomson, R.A.M.C., to Laura F. M. Lawrence Smith, daughter of Mr. and Mrs. Lawrence Smith, of Hurstpierpoint, Sussex.

DEATHS.

BRADBURN.—On March 8th, at Wasperton, Warwick, Thomas Stratford Bradburn, M.A. Oxon., M.R.C.S., L.R.C.P., D.P.H., temporary surgeon, R.N., aged 37.

HINE.—On March 16th, at Farnham, Harry Hine, L.R.C.P., M.R.C.S., aged 63.

FLUX.—On March 18th, at the Royal Free Hospital, George Belben Flux, M.D., late Captain, R.A.M.C.

LEWIS.—On March 10th, at Anlaby-road, Hull, after a short illness, Sybil Lonie Lewis, L.R.C.P. & S. Edin., L.F.P.S. Glasg.

MOORE-KEYS.—On March 16th, at a nursing home, Lieutenant-Colonel Christopher William Moore-Keys, late R.A.M.C., aged 71.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

BRISTOL UNIVERSITY.—The Long Fox Memorial Lecture will be delivered in the Physiological Lecture Theatre of the University of Bristol on March 28th, at 5 P.M., by Professor A. F. Stanley Kent, the subject being Industrial Fatigue.

BY the will of the late Mr. James Thompson, of Hatfield, Herts, the testator bequeathed £1000 to St. Bartholomew's Hospital and £250 to the Cottage Hospital at Potter's Bar.

Medical Diary for the ensuing Week.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.
MEETINGS OF SECTIONS.
Thursday, March 28th.

MEDICINE (Hon. Secretaries—Charles R. Box, W. Cecil Bosanquet): at 5 P.M.
Lecture:
Sir Bertrand Dawson, K.C.V.O., will give a Lecture on "Spirochætosis Icterohæmorrhagica."

MEDICAL SOCIETY OF LONDON, 11, Chandos-st., Cavendish-sq., W.1.
MONDAY, March 25th.—8.30 P.M., Paper:—Col. G. E. Gask, A.M.S., D.S.O.: Surgery of Penetrating Wounds of the Thorax.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

POST-GRADUATE COLLEGE, West London Hospital, Hammersmith-road, W.
Clinics each week-day at 2 P.M., Wednesday, Friday, and Saturday also at 10 A.M.

NORTH-EAST LONDON POST-GRADUATE COLLEGE, Prince of Wales's General Hospital, Tottenham, N.
Out-patients each day at 2.30 P.M.
(Details of the Post-Graduate Courses were given in the first issue of the month.)

THE THROAT HOSPITAL, Golden-square, W.
MONDAY, March 25th.—5.15 P.M., Special Demonstration of Selected Cases.
THURSDAY.—5.15 P.M., Clinical Lecture.

METEOROLOGICAL READINGS.

(Taken daily at 8.30 a.m. by Steward's Instruments.)
THE LANCET Office, March 20th, 1918.

Date.	Rainfall.	Solar Radio in Vacuo.	Maximum Temp. Shade.	Min. Temp.	Wet Bulb.	Dry Bulb.	Remarks.
Mar. 14	...	80	52	38	41	43	Fine
,, 15	0·01	80	48	37	39	42	Fine
,, 16	...	62	43	34	38	37	Foggy
,, 17	...	85	54	35	40	42	Overcast
,, 18	...	90	58	40	46	48	Cloudy
,, 19	...	62	52	39	43	41	Overcast
,, 20	0·05	75	60	40	45	48	Fine

Other information which we have been accustomed to give in these "Readings" is withheld for the period of the war.

EDITORIAL NOTICES.

In consequence of the pressure on our space and the shortage of paper, the Editor may be compelled to abbreviate communications, as an alternative to their rejection, when time does not allow them to be reconsidered by their authors.

It is especially requested that early intelligence of local events having a medical interest, or which it is desirable to bring under the notice of the profession, may be sent direct to this office.

Lectures, original articles, and reports should be written on one side of the paper only, *and when accompanied by blocks it is requested that the name of the author, and if possible of the article, should be written on the blocks to facilitate identification.*

Letters, whether intended for insertion or for private information, must be authenticated by the names and addresses of their writers—not necessarily for publication.

We cannot prescribe or recommend practitioners.

Offices: 423, STRAND, LONDON, W.C. 2.

MANAGER'S NOTICES.

TO SUBSCRIBERS IN THE UNITED STATES.

Messrs. Wm. Wood and Co., of New York, have relinquished their Agency for the supply of THE LANCET in the United States. The Manager of THE LANCET will be pleased to supply copies direct from the London Office to subscribers in the United States at the strictly prepaid rate of $8 for twelve months. Subscriptions may commence at any time. Drafts and Money Orders should be made payable to the Manager, Mr. CHARLES GOOD, 1, Bedford-street, Strand, London, W.C. 2, England.

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WILL Subscribers please note that only those subscriptions which are sent direct to the Proprietors of THE LANCET at their Offices, 423, Strand, London, W.C. 2, are dealt with by them? Subscriptions paid to London or to local newsagents (with none of whom have the Proprietors any connexion whatever) do not reach THE LANCET Offices, and consequently inquiries concerning missing copies, &c., should be sent to the Agent to whom the subscription is paid, and *not* to THE LANCET Offices.

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Quarter Page, £2. Half a Page, £4.
Entire Page, £8.
Special terms for Position Pages.

Advertisements (to ensure insertion the same week) should be delivered at the Office not later than Wednesday, accompanied by a remittance.

BOOKS, ETC., RECEIVED.

BUTTERWORTH AND CO., London.
Banking and Currency. By Ernest Sykes, B.A. Oxon. With Introduction by F. E. Steele. 4 ed. 5*s.*

COLE AND CO., 92-96, Vauxhall Bridge-road, London.
Cause, Prevention and Treatment of Cancer and Other Diseases. By Lieut.-Col. W. H. Hildebrand, late Indian Army (retired).

HEADLEY BROTHERS, London.
Aims of Labour. By Rt. Hon Arthur Henderson, M.P. 1*s.*

KEGAN PAUL, London.
A History of Departed Things. By Mrs. Henry Head. 3*s.* 6*d.*

LEA AND FEBIGER, New York and Philadelphia.
A Practical Treatise on Fractures and Dislocation. By L. A. Stimson, M.D. 8 ed. $6.00.

SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE, London.
The Baby. By Sophia Seekings, M.D. 9*d.*

Communications, Letters, &c., to the Editor have been received from—

A.—Mr. R. J. Albery, Lond.; *The Aeroplane*, Lond., Editor of; Association of Panel Committees, Lond.; Lieut.-Col. J. G. Adami, A.D.M.S.; Australian Imperial Force, Lond., Director of Medical Services of; Capt. W. Attlee, R.A.M.C.; Capt. R. A. Alston.

B.—Board of Education, Lond.; Mr. A. Black; Board of Agriculture and Fisheries, Lond.; Capt. H. W. Bayly, R.A.M.C.(T.); Messrs. Baillière, Tindall, and Cox, Lond.; Dr. G. B. Brown, Maidstone; Major A. S. G. Bell, R.A.M.C.

C.—Carnegie United Kingdom Trust, Dunfermline; Dr. R. Creasy, Lond.; Mr. E. Condy, Lond.; Dr. A. S. Cobbledick, Lond.; Dr. S. D. Clippingdale, Lond.; Dr. F. Clifford, Swansea; Mr. A. E. Conder; Dr. A. J. Chalmers, Khartoum.

D.—Dr. G. H. Dart, Lond.; Capt. S. C. Dyke, R.A.M.C.; Dr. B. V. Dunn, Loughborough; Dr. M. Dockrell, Lond.; Dr. V. Dickinson, Lond.

E.—Dr. Ettles, Lond.; Capt. J. I. Enwright, R.A.M.C.; Capt. W. Edmond, R.A.M.C.; Mr. D. L. Eadie, Edinburgh.

F.—Dr. T. Fisher, Norwich; Capt. F. R. Fraser, R.A.M.C.; Messrs. H. Frowde and Hodder and Stoughton, Lond.; Dr. W. S. Fraser, Newcastle-on-Tyne; Factories, Chief Inspector of, Lond.

G.—Mr. A. L. Grant, Burghead; Col. G. E. Gask, D.S.O., R.A.M.C.(T.); Dr. A. K. Gordon, Lond.

H.—Lieut. M. L. Hatch, R.F.C.; Lieut. E. Hughes, R.A.M.C.; Dr. H. Head, Lond.; Capt. F. M. Hughes, R.A.M.C.(T.); Dr. G. T. Hebert, Lond.; Mr. F. H. Hawley, Blythe Bridge; Mr. W. B. Hallowes, Newark; Mr. P. B. Hoeber, New York.

J.—Capt. W. Johnson, R.A.M.C.

K.—Kensington, Medical Officer of Health of; Dr. L. J. Kidd, Lond.; Dr. H. C. Kidd, Bromsgrove; Major A. E. Kamar.

L.—London Temperance Hospital, President of; Local Government Board, Lond.

M.—Metropolitan Asylums Board, Lond.; Miss M. Moore, Lond.; Mental After-care Association, Lond.; Dr. W. C. Morton, Leeds; Capt. C. E. Murphy, R.A.M.C.; Dr. J. D. Malcolm, Lond.; Dr. H. Munro, Sevenoaks; Mr. J. H. Moysey, Lond.; Mr. J. Y. W. MacAlister, Lond.

N.—National Association for the Prevention of Infant Mortality, Lond., Sec. of.

P.—Prof. F. G. Parsons, Lond.; Major W. Pearson, R.A.M.C.

R.—Mr. H. Ridgeleigh, York; Royal Microscopical Society, Lond.; Royal Medical Benevolent Fund, Lond., Hon. Sec. of; Royal Maternity Charity, Lond.; Dr. A. Routh, Lond.; Royal Academy of Medicine in Ireland, Dublin.

S.—Society for the Study of Inebriety, Lond.; Capt. W. C. Stevenson, R.A.M.C.; Dr. D. N. Seth-Smith, Bildeston; Mr. W. E. Sargant, Lond.; Dr. H. Scurfield, Sheffield; Dr. Florence Stoney, Lond.

T.—Dr. J. Tatham, Oxted; Dr. A. H. Thompson, Lond.; Capt. J. C. Tull, C.A.M.C.; Col. W. Thorburn, C.B., A.M.S.

W.—Capt. F. W. Watkyn-Thomas, R.A.M.C.(T.); Dr. S. A. K. Wilson, Lond.; Dr. C. H. Whiteford, Plymouth; Mr. H. G. Williamson, Lond.; Dr. F. J. Wethered, Falmouth; Dr. F. P. Weber, Lond.; Mr. J. A. Wilson; West London Hospital Post-Graduate College, Dean of.

Notes, Short Comments, and Answers to Correspondents.

COLONIAL HEALTH REPORTS.

Cyprus.—A report on the Blue-book for 1916–17, drawn up by Mr. H. C. Lukach, assistant secretary to the Government, shows that the estimated population on Dec. 31st was 298,775. The birth-rate for 1916 was 28·1 per 1000, and the death-rate 17·1; the death-rate per 1000 of children under the age of 1 year was 135·4. The death-rate is the lowest on record since vital statistics have been available.

This is the fourth year of the campaign against malaria, initiated as the result of the visit of Sir Ronald Ross in 1913. Both the malarial incidence and the spleen rate show a fairly uniform and steady reduction. There were only 3752 cases during the year as returned by the Government medical officers, as compared with 4539 in 1915, 7342 in 1913, and 10,035 in 1912; figures from private practitioners are not available. The spleen census, which was taken at the end of 1916, is also satisfactory, showing a rate for the whole island of 7·6 per cent., as against 21·82 per cent. in the spring of 1913.

Useful additions were made during the year to the Nicosia General Hospital; the accommodation in the operating room was improved, private quarters were provided for the sister in charge, and the water-supply was increased. 1010 patients received treatment in the wards during the year; there were 76 deaths. 36 cases (as compared with 20 in the previous year) were admitted to the detached wards for advanced and destitute cases of consumption; 11 of these terminated fatally. The out-patient department was attended by 7673 patients. The district hospitals of Larnaca, Kyrenia, Limassol, Famagusta, and Paphos, which are supported by Government, have continued to carry out their valuable work; the total number of patients admitted during the year was 1430. The death-rate in the well-managed Kyrenia Hospital was only 1·1 per cent., the lowest rate of any hospital in the island.

There were only 4 admissions to the leper farm (as against 5 in 1915), and there were 6 deaths. The number of lepers at the farm at the close of the year was 80, the lowest on record. The Government maintains in Nicosia a home for the children born in the leper farm of leper parents. At present there are 11 children in the home, their ages ranging from 6 to 17. In all, 4 children, having been educated and taught a trade, have hitherto been discharged from the home with a Government grant of £5 to start them in life. It is interesting to record that in none of these children or in any of the attendants at the farm has any sign of the disease appeared.

The public health and general sanitary condition on the island have been most satisfactory, and there was no serious outbreak of epidemic disease. Once again the island enjoyed complete immunity from plague and cholera, despite the number of cases of plague which occurred in Egypt during the year.

Seychelles.—The estimated population of this colony on Dec. 31st, 1916, was 24,109 (11,949 males and 12,160 females). There were during the year 755 births and 405 deaths.

The number of patients treated in the Victoria Hospital was 544. In the various Government dispensaries 2947 persons were treated, an increase of 784 on the previous year. The chief medical officer considers that this large increase is due to the people suffering from reduced means. Some cases of acute gangrenous cellulitis occurred, and there was a widespread epidemic of jaundice, principally among children. The general sanitary condition of the colony was satisfactory. The maternity home increases yearly in popularity; the number of admissions in 1916 was 225. There were nine persons (all males) in the Leper Asylum at the end of the year.

Cayman Islands (Jamaica).—According to the last census the population totalled 5564 (2322 white, 2211 coloured, and 1031 black). During 1916 there were 190 births and 54 deaths, the death-rate being only 10 per 1000.

The Government Dispenser, who has undertaken medical duties in respect of simple ailments and general health conditions during the absence of a Government Medical Officer, reports that the health of the islands continues to be quite satisfactory. There have been no epidemics of any form or diseases of a virulent nature. There is a small building kept for the purpose of isolating infectious diseases, but it is not generally used.

"The Cayman Islands," writes the Commissioner, Mr. A. C. Robinson, in his annual report, "are among the healthiest places in the world. There are no cases of illness attributable to climatic conditions. The weather is warm for the greater part of the year. The prevailing breeze is from the south-east from April until October, when the cool season begins with a change of wind to the north and north-west in the early part of November. The average temperature in the hot months is 83° morning, 89° midday, and 86° evening, and in the cool months (November to March) 71° morning, 80° midday, and 74° evening."

THE VIRTUES OF WAR BREAD.

THERE have been differences of opinion in America, as in this country, regarding the taste of war bread. The Health Commissioner for Chicago says in a recent issue of his *Bulletin* that "it is no use kicking at having to eat bread made of barley, oatmeal, and buckwheat when really the new article of food is as palatable as the bread of former years, and if anything more nutritious." He suggests emulation of the optimism of the old lady who, having but two teeth remaining, said: "But, thank God, they hit!"

"ANIMAL LIFE AND HUMAN PROGRESS."

THE seventh of this series of lectures was delivered by Professor R. C. Punnett, F.R.S., professor of genetics in the University of Cambridge, at King's College, London, on March 13th. The science of breeding, he said, had assumed great importance during the past 30 years owing to the work of the school at Cambridge of which Professor Bateson was the head. Our first insight into the laws of heredity and variation was due to the discovery of Mendel in regard to recessive and dominant characters in peas, who had been able to analyse seven different characters, but since that time the experiments, which were still going on, had resulted in the analysis of 35 different characters. Professor Punnett illustrated the Mendelian law by the results obtained in crossing strains of bantams, remarking that through the energy of Professor Morgan and his colleagues working in America results of remarkable interest had been obtained. Experiments had led to an ingenious hypothesis which was likely to play a considerable part in the near future of these studies—namely, that the separate chromosomes in the germ cell became twisted, a portion of the one becoming united with the other when the two broke apart. Everything was in an experimental stage, but the bearing of this hypothesis on sex inheritance might have an economic importance, for instance, in the selection of male and female fowls immediately on hatching. The latest work in genetics appeared to show that there was a difference in the chromosome of the male and female; but while in the case of fowls it was the female that appeared to produce two kinds of germ cells, from a sex-determining point of view in the *Drosophila* it was the male which was heterozygose in sex and the female homozygose. In regard to the inheritance of secondary sexual characters, the castration of fowls had shown that the qualities which had been regarded as belonging exclusively to one sex might be inherited and brought out in the other. A proper comprehension of this subject might lead to a better understanding with regard to the way in which the two human sexes looked upon the capacities of each other. Not only direct breeding experiments but many of those in connexion with the viability or non-viability of zygotes must have an important bearing on economic questions. Problems which had arisen in connexion with artificial parthenogenesis were indications that pointed to the fact that there was going to be a great increase of our knowledge on these subjects in the future. Finally, the lecturer drew a picture of an ideal State in which everyone recognised the importance of breeding in regard to plants and animals, and in which every member of the community took part, recognising that knowledge was the ultimate source of wealth and that the stability of the State depended largely on the spread of knowledge among its citizens.

On March 27th, at 5.30 P.M., Professor Robert Newstead, F.R.S., will discuss the Tse-tse Flies and Colonisation, that being the last lecture of the series.

AN AUTHOR ON HIS REVIEWER.

To the Editor of THE LANCET.

SIR,—My attention has been called to a review of my novel, "The Weird Adventures of Professor Delapine of the Sorbonne" (Routledge and Son), in your journal. In this review the critic states, among other things, that "we credit Mr. Johnson with believing what he was told, but we think that he displays more capacity for believing than he is likely to find among his readers. This will be due partly to the fact that he is quite unable to tell a story in a way that might be expected to produce any effect upon the intelligence of others."

Now, Sir, I wrote the novel, not with the idea of converting others, but simply to amuse my two sons who were fighting at the front. *I never wanted to tell the truth.* No really good novelist ever described things as they really are; were he to do so, the book would be unreadable. The decay in the art of artistic lying is one of the most melancholy signs of the age. Does anyone suppose for a moment that Shakespeare's characters ever really spoke as he makes them speak? Shakespeare was an artist, and the whole secret of art lies in expounding truth through one's imagination. What the reviewer says about my novel would apply equally well to Sir Conan Doyle's recent novel, "The Lost World," only in his case he goes much further than I have done, for he actually illustrates his romance by a series of photographs "taken on the spot" (!) in order the more to impress the reality of the book on the reader. But we know that the work is only a splendid lie from beginning to end. Had the reviewer taken the pains to read my book he would have seen that I clothed the real facts with a halo of romance. The former are undoubtedly in the book—the halo of romance lies in the supernormal as well as in the conversations of the characters. Moreover, nine-tenths of the work has nothing whatever to do with the supernormal or supernatural. It was intended to amuse rather than instruct. Still, as the novel has already been translated into two foreign languages (French and

Hungarian), and offers have been received for its speedy translation into most of the other foreign languages, it matters little what our learned reviewer thinks of its merits. In conclusion, I trust when he applies himself to the task of reviewing in future, he will bear in mind the words of Leonardo da Vinci: "Mal fai se taldi, e peggio è si tu riprendi la cosa quando bene tu nolla 'ntendi."

I am, Sir, yours faithfully,
GEO. LINDSAY JOHNSON, M.D., F.R.S. (Italy).

Britannia Buildings, West-street, Durban, Jan. 20th, 1918.

*** Our reviewer writes: I should have found Mr. Johnson's book unreadable had not duty made me read it. The difference between the sort of lying which creates no illusion and "artistic lying," as exhibited by Defoe, Poe, and Conan Doyle, is the difference between ability and inability to write a story. Mr. Johnson, in my opinion, has not the equipment of the novelist, though I am glad that his sons have been amused, and that foreign publishers have manifested a universal belief that their clients will be similarly influenced. Mr. Johnson forces me to repeat my conviction that his novel is not a good one.

SPIRIT DUTY (VOLUNTARY HOSPITALS) GRANT.

WE understand that the Local Government Boards for England and Wales and for Scotland are now prepared to receive applications from voluntary hospitals for grants in respect of payments of duty involved by the use during the calendar year 1917 in these hospitals of duty-paid spirit, or drugs containing duty-paid spirits, for medical and surgical purposes. Forms of application will be sent only to those hospitals to which a grant was paid last year. Any other hospital which desires to make application should communicate immediately with the Secretary to the Local Government Board for England and Wales or the Secretary to the Local Government Board for Scotland, as the case may be.

LIQUID PARAFFIN AS A TASTE-SUBSTITUTE FOR BUTTER AND SALAD OIL.

To the Editor of THE LANCET.

SIR,—In your issue of Feb. 16th (p. 282) a note, referring to mine on the above subject, mentions the importance (from the medical point of view) of a standard viscosity for the paraffin—a question in connexion with which certain experiments were made at THE LANCET Laboratory. This is at present of some interest, because those who derive benefit from the internal use of liquid paraffin can have it mixed with cocoa-butter in order to obtain a suitable (initial) viscosity of the mixture, and to produce at the same time a substitute for animal butter or margarine possessing both some of the therapeutic lubricating quality of liquid paraffin and the nutritive value (as a real food) of cocoa-butter. Of course, it must be admitted, however, that as the cocoa-butter is partially gradually absorbed during its passage along the alimentary canal, the initial viscosity of the oily mixture becomes more or less altered. Mr. J. H. Evans has kindly demonstrated to me that a substance of about the consistence of ordinary butter can be obtained by mixing 34 parts by weight of cocoa-butter with 66 parts of ordinary British Pharmacopœial liquid paraffin. The paraffin is stirred up with the melted cocoa-butter and then left to stand until the mixture sets (which it takes a long time to do—even a day or so—if not artificially cooled). A somewhat greater proportion of cocoa-butter in the mixture seems to me to be rather an improvement. The flavour of cocoa may, if desired, be overcome by the addition of a little salt. By mixing it with liquid paraffin one of the difficulties in using cocoa-butter as a substitute for ordinary table butter is obviated. Similarly, ordinary dripping can be mixed with a moderate proportion of liquid paraffin to soften it for spreading on bread or toast as a substitute for table butter.—I am, Sir, yours faithfully,

March 16th, 1918. F. PARKES WEBER, M.D., F.R.C.P.

FRENCH FOR DOCTORS AND NURSES.

A LITTLE book has just been published under this title by the University of Chicago Press, Chicago, to help American doctors and nurses (1) to understand what may be said to them in French; (2) to make themselves understood in French; (3) to understand printed French. In its 147 small pages it makes a valiant effort to do these things, and within its limits promises success. The authors, Mr. E. H. Wilkins, Mr. A. Coleman, and Miss Ethel Preston, state that the royalties will be devoted to the work of the Red Cross, but the price is not stated. For the representation of the French sounds they have used a set of phonetic symbols for which they claim at least the merit of simplicity. Where the vowel is followed by the nasal sound it is put in italics, the "n" or "m" not being printed. We have tried the imitated pronunciation and can easily understand the real French phrase intended without seeing it. For imitating the sound of Reims, for example, *rès* is given. French dictionaries for Frenchmen vary in trying to imitate this sound; four dictionaries give reinss, rance, rins, rinss, the "n" being nasal. On p. 128 of the little book of medical French "laboratory sponges" for "éponges" looks strange, and "non-absorbent" is hardly the same as "imperméable." The usual meaning of "imperméable" is "waterproof" or "waterproof cloth." On p. 111 "couloir" means more generally a "passage or corridor" rather than a "hall," but it may mean "lobby." On p. 80 "tie"—"la traverse," looks peculiar to English eyes; a "tie" in America is a "sleeper" (railway) in England. On p. 127, "Do you wish the bed-pan?" is "Voulez-vous le pistolet?" French dictionaries fight shy of this expression in this meaning, but it is picturesque. Indeed, no English-French dictionary appears to mention "bed-pan" at all. Can it be modesty which accounts for this omission?

THE DUBLIN MILK-SUPPLY.

UNDER the auspices of the Carnegie United Kingdom Trustees a report of a bacteriological investigation into the Dublin milk-supply by Mr. D. Houston, F.L.S., made during the summer and autumn of 1917, has been issued by the Coöperative Reference Library, the Plunket House, Dublin, price 6*d*. For the most part the milk analysed was obtained by nurses at infant welfare centres, and the result of the investigation shows a most appalling state of affairs. So bad was the bacteriological character of some of the samples that, as Mr. Houston says, a water-supply giving evidence of a similar state of contamination "would be instantly closed by order of the Local Government Board as being a dangerous menace to public health." The object of the report is to lay before the public a fair statement of the present condition of the Dublin milk-supply and to submit what experience has proved to be the best practical lines of reform. In a preface by Dr. Oliver St. J. Gogarty a suggestion is made for the setting up of a national institute to deal with the distribution of milk in Ireland.

HOSPITAL MAGAZINES.

THE Easter Number of the *Gazette of the 3rd London General Hospital* (Wandsworth, S.W. 18. Price 4*d*.) contains reproductions of portraits of Surgeon-General Goodwin, Director-General of the Army Medical Service, and of his predecessor, Sir Alfred Keogh. Some amusing sketches, the work of R. B. Ogle, J. H. Dowd, H. E. Harman, and of others whose work was lately exhibited on behalf of the hospital at the Camera Club, are reproduced in the magazine, and as the sales benefit the occupants of the 3rd London General Hospital the venture should receive hearty support.

The February issue of *The Ration* (Reading War Hospitals, Reading, price 2*d*.) is also particularly good, both in illustrations and letterpress. Like the foregoing, it adds to the comforts of the patients, all profits being devoted to that purpose.

LECTURES ON INFANT CARE.

A SPECIAL course of lectures on this subject, with practical demonstrations, will be held at Aylesbury on successive Wednesdays from April 10th to May 1st and on Saturday, May 11th. The series is intended for medical officers, nurses, midwives, health visitors, teachers, voluntary infant-welfare workers, committees of nursing associations, school-care committees, and others, the lecturers including Mr. H. R. F. Brooks, L.D.S., Dr. H. C. Cameron, Dr. J. S. Fairbairn, Major A. H. Hogarth, Dr. Margaret Hogarth, Dr. J. Kerr, Dr. E. Pritchard, and Dr. C. Dorothy Shepherd. The fees vary from 7*s*. 6*d*. for the course to 1*s*. for a morning or afternoon session and a considerable reduction is made for groups from nursing or other associations. There are also a certain number of scholarships, including fees and out-of-pocket expenses, available for nurses and health visitors. Further particulars may be obtained from the National Association for the Prevention of Infant Mortality, 4, Tavistock-square, London, W.C. 1, under whose auspices the lectures are being delivered.

A POINT IN THE TREATMENT OF MALARIA.

To the Editor of THE LANCET.

SIR,—When doubt is expressed by writers as to the specificity of quinine in the treatment of malaria the following point is worthy of remembrance: 30 years ago practitioners in the tropics found that often when quinine seemed to fail it would rapidly relieve the malarial attack as soon as free emesis, or catharsis, or both, had been produced. I am, Sir, yours faithfully,

London, N.W., March 15th, 1918. LEONARD J. KIDD.

Midlander.—We think it possible that a representation may be made to the authorities; this possibility would be defeated by publicity at the moment.

M.D. Louvain.—The suggestion can only follow on discussion, which should therefore be strictly avoided in such a case.

SUPPLEMENT to THE LANCET, March 23, 1918

METEOROLOGICAL OFFICE

Advisory Committee on Atmospheric Pollution

REPORT ON OBSERVATIONS IN THE YEAR 1916-1917

Forming the Third Report of the Committee for the Investigation of Atmospheric Pollution

CONTENTS

INTRODUCTION: Committee. Classification and Method of Treating Results. Reference to THE LANCET for Full Tables of Returns.

RESULTS obtained in the Year April, 1916, to March, 1917. Tables included in Report.

DISCUSSION OF RESULTS: Comparison of 1914-15, 1915-16, and 1916-17. Highest and Lowest Mean Monthly Deposit for 1916-17.

SEASONAL VARIATIONS: Months of Highest and Lowest Deposit. Comparison of Summer and Winter Deposits.

RELATION OF DEPOSITS to Rainfall and Each Other.

MEASUREMENT OF SUSPENDED IMPURITY: Standard Air Filter. Calibration, by J. G. Clark. Records Obtained. Experimental Work in Hand.

INTRODUCTION.

The publication of the Committee's Third Annual Report has been delayed somewhat owing to difficulties arising out of the existing war conditions. The Committee has been enlarged by the addition of representatives from the following Authorities:—

Advisory Council to the Department of Scientific and Industrial Research,
Birmingham,
Liverpool,
London, City of,
London County Council,
Malvern,
Manchester,
Newcastle-on-Tyne,
Oldham,
Rochdale,
St. Helens,
Stirling,

and is now made up as follows:—

Sir NAPIER SHAW, F.R.S., Director of the Meteorological Office (*ex officio*).

Captain C. J. P. CAVE (Past President of the Royal Meteorological Society).

Mr. J. G. CLARK, F.C.S.

Professor J. B. COHEN, B.Sc., Ph.D., F.R.S. (Professor of Organic Chemistry, Leeds University).

Dr. H. A. DES VŒUX (Hon. Treasurer, Coal Smoke Abatement Society).

Dr. R. LESSING, F.C.S.

Dr. J. S. OWENS (Coal Smoke Abatement Society).

Dr. E. J. RUSSELL, Director of Rothamsted Experimental Station.

Bailie W. SMITH (Member of Departmental Committee on Smoke Abatement, Glasgow).

Mr. S. A. VASEY, F.I.C., F.C.S. (Director of THE LANCET Laboratory).

Mr. F. J. W. WHIPPLE (Superintendent of the Statistical Division, Meteorological Office).

Mr. W. S. CURPHEY, Advisory Council.

Dr. JOHN ROBERTSON, Birmingham.

Dr. W. HANNA, Liverpool.

Dr. W. J. HOWARTH, City of London.

Mr. HENRY MILLS, J.P., London County Council.

Mr. O. THORP, Malvern.

Professor HALDANE GEE, Manchester.

Mr. C. T. STABLEFORTH, J.P., Newcastle-on-Tyne.

Dr. J. B. WILKINSON, Oldham.

Dr. J. R. ASHWORTH, Rochdale.

Dr. J. CATES, St. Helens.

Mr. JOHN FYFE, Stirling.

In the present Report the method of classification and treatment adopted in the Committee's Second Annual Report has been adhered to. No alterations have been made during the year in the methods of observing or analysis; the conditions

are therefore similar to those of last year, and for an explanation of the units used in classification reference is to be made to the Second Report.

It has been thought desirable not to burden the Report with detailed lists of monthly deposits from the various stations for the reasons mentioned in the Committee's Second Report. These are, however, available for reference if required, having been published in full in THE LANCET of the following dates:—

Return for	Published in THE LANCET of
April, 1916.	Sept. 23rd, 1916.
May, ,,	,, ,, ,,
June, ,,	,, Nov. 25th, ,,
July, ,,	,, ,, ,, ,,
Aug., ,,	,, Feb. 24th, 1917.
Sept., ,,	,, ,, ,, ,,
Oct., ,,	,, June 2nd, ,,
Nov., ,,	,, ,, ,, ,,
Dec., ,,	,, ,, 16th, ,,
Jan., 1917.	,, ,, ,, ,,
Feb., ,,	,, ,, Aug. 4th, ,,
Mch., ,,	,, ,, ,, ,,

Of the eight London stations that at the Meteorological Office is used by the Committee for experimental purposes, the following six—Embankment Gardens, Finsbury Park, Ravenscourt Park, Southwark Park, Wandsworth Common, Victoria Park—are operated by the London County Council, and that in Golden Lane is the only one in the City of London and is managed by the Public Health Department, Corporation of London.

RESULTS OBTAINED IN THE YEAR APRIL, 1916, TO MARCH, 1917.

Tables Included in Report.

TABLE I. shows the monthly deposit for two stations, Newcastle-on-Tyne and Malvern. Malvern gives consistently the lowest deposit, and although Newcastle is not, strictly speaking, the station giving the highest deposit, it is the station giving the highest deposits for which full analyses are available.

TABLE IA.—This is supplementary to Table I. and gives the total solids deposited in Malvern as compared with Newcastle-on-Tyne, Rochdale, and St. Helens, the three latter being stations having a very high deposit.

TABLES II. and III. show respectively a comparison of monthly means for all stations for the half-years April–September, 1915 and 1916, and October–March, 1915-16 and 1916-17.

TABLE IV. compares the monthly means for the summer and winter months of the year 1916-17.

TABLES V. and VI. give the classification of the elements of pollution under Groups A, B, C, and D for the same periods as II. and III., and based upon the monthly means as given in Tables II. and III.

TABLES VII. and VIII. give the totals of each group—A, B, C, and D—for each element of pollution for all stations taken. These tables are prepared from Nos. V. and VI. and cover the same periods.

TABLE IX. shows the average deposit of each element of pollution for each month for a group of 18 stations which provided practically continuous observations over the whole year from April, 1916, to March, 1917. This also shows the amount of each deposit per 100 mm. of rainfall.

TABLE X.—This gives the average daily deposit in tons per square kilometre of each element of pollution for each month for the selected group of 18 stations referred to under Table IX. The table was prepared owing to the number of days in the month not being constant for all months. The figures, therefore, are derived from the total deposit in each month divided by the number of days in the month and by the number of stations included.

TABLE I.—*Monthly Deposit at Two Selected Stations, Malvern and Newcastle.*

Station.	—	Rainfall in millimetres.	Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.		
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).
	1916.										
Malvern ...	April	28	0·01	0·09	0·24	0·31	0·90	1·54	0·42	0·09	0·02
Newcastle ...	,,	32	0·21	1·81	7·28	1·28	3·64	14·22	1·56	0·21	0·06
Malvern ...	May	41	0·01	0·21	0·30	0·32	1·03	1·87	0·47	0·11	0·02
Newcastle ...	,,	75	0·16	5·34	10·09	2·68	4·91	23·20	3·00	0·50	0·11
Malvern ...	June	42	nil	0·18	0·46	0·46	1·10	2·20	0·56	0·14	0·02
Newcastle ...	,,	50	0·49	4·97	13·26	1·50	5·81	26·04	2·50	0·34	0·06
Malvern ...	July	42	trace	0·18	0·25	0·38	0·62	1·43	0·38	0·05	0·01
Newcastle*	,,	—	—	—	—	—	—	—	—	—	—
Malvern ...	August	62	trace	0·20	0·23	0·62	1·46	2·52	0·69	0·15	0·02
Newcastle ...	,,	67	0·28	5·10	10·14	2·83	5·80	24·15	2·59	0·72	0·13
Malvern ...	September	29	nil	0·23	0·23	0·36	0·82	1·64	0·39	0·08	0·03
Newcastle ...	,,	34	0·30	3·71	6·84	0·95	3·71	15·51	1·73	0·24	0·06
Malvern† ...	October	—	—	—	—	—	—	—	—	—	—
Newcastle ...	,,	62	0·36	5·78	15·92	5·61	14·45	42·12	4·51	5·30	0·15
Malvern ...	November	—	—	—	—	—	—	—	—	—	—
Newcastle ...	,,	78	0·14	5·15	13·11	3·58	8·25	30·23	2·46	2·76	0·11
Malvern ...	December	—	—	—	—	—	—	—	—	—	—
Newcastle ...	,,	95	0·37	5·13	11·59	2·08	4·17	23·34	2·62	0·50	0·11
	1917.										
Malvern ...	January	33	nil	0·33	0·72	0·64	1·98	3·68	0·74	0·25	0·01
Newcastle ...	,,	82	0·48	5·63	17·59	3·75	5·40	32·86	2·80	1·56	0·15
Malvern ...	February	31	0·02	0·24	1·35	0·49	1·97	4·08	0·69	0·23	0·01
Newcastle ...	,,	21	0·31	4·98	8·62	1·25	3·28	18·43	1·45	0·44	0·03
Malvern ...	March	58	trace	0·11	0·30	1·26	2·60	4·30	0·90	0·28	0·02
Newcastle ...	,,	44	0·03	1·28	1·31	1·94	3·44	8·00	2·09	1·25	0·08

* Results lost through accident.

† Malvern temporarily suspended observations.

TABLE IA.—*Monthly Deposit of Total Solids at Four Selected Stations.*

Station.	1916.									1917.		
	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.
Malvern*	1·54	1·87	2·20	1·43	2·52	1·64	—	—	—	3·68	4·08	4·30
Newcastle	14·22	23·20	26·04	Lost.	24·15	15·51	42·12	30·23	23·34	32·86	18·43	8·00
Rochdale	43·06	27·96	29·32	29·70	26·92	20·46	28·52	15·67	16·47	15·82	8·82	29·75
St. Helens†	—	—	—	—	—	—	—	—	—	18·31	35·63	59·08

* October to December, 1916, temporarily suspended.

† April to December, 1916, had not commenced observations. 1917 results not reliable.

DISCUSSION OF RESULTS.

We will again direct our attention to the following aspects of the problem, as discussed in the Second Report:—

1. Comparing the year 1916–17 with 1915–16, is there any indication of an improved state of the atmosphere or the reverse?

2. What are the stations showing the greatest and least amount of deposit?

3. How is the amount of impurity deposited affected by the seasons?

4. Is there any indication of a relation existing between rainfall and deposit or between the different elements of pollution?

Referring to Tables II. and III., and comparing the two years 1915-16 and 1916-17 on the basis of the total solids deposited, the stations fall into three groups: (1) Those in which the total deposit in 1916-17 was greater than in 1915-16; (2) those in which it was less; and (3) those which do not show a greater alteration in total solids than 0·3 metric ton per square kilometre.

The following is a list of these stations so grouped.

Total Solids Deposited in the Summer Months of 1916–17 Compared with 1915–16.

Deposit.		
Increased in 1916–17.	Diminished.	Unchanged.
Exeter. London:— Meteorological Office. Finsbury Park. Ravenscourt Park. Victoria Park. Wandsworth Common. Manchester:— School of Technology. Newcastle-on-Tyne. York. Coatbridge. Glasgow:— Alexandra Park. Bellahouston Park. Blythswood Square. Botanic Gardens. Richmond Park. South Side Park. Greenock.	Leicester. London:— Embankment Gardens. Southwark Park. Golden Lane. Manchester:— Queen's Park. Glasgow:— Ruchill Park. Tollcross Park.	Malvern. Glasgow:— Victoria Park. Leith.

Total Solids Deposited in the Winter Months of 1916–17 Compared with 1915–16.

Deposit.		
Increased in 1915–16.	Diminished.	Unchanged.
London:— Ravenscourt Park. Malvern. Newcastle-on-Tyne. Coatbridge. Greenock.	Leicester. London:— Meteorological Office. Embankment Gardens. Southwark Park. Victoria Park. Wandsworth Common. Golden Lane. Manchester:— Queen's Park. School of Technology. York. Glasgow:— Alexandra Park. Bellahouston Park. Blythswood Square. Botanic Gardens. Richmond Park. Ruchill Park. South Side Park. Tollcross Park. Victoria Park.	London:— Finsbury Park.

An examination of the above list for the summer months shows that the total deposit has increased in the majority of stations in 1916–17 as compared with 1915–16. It will be remembered that the year 1915–16 showed a similar increase over 1914-15; it would therefore seem that during the three years investigated there has been a continuous increase in the amount of solid impurity deposited in the summer months in most of the stations.

Turning now to a comparison of the winter months for the same two years, we find that the state of affairs is different, as in the great majority of stations the deposit has diminished in 1916-17. Comparing this with the corresponding list in the Committee's Second Report, it will be seen that there is evidence of considerable improvement in the state of the atmosphere. Too much reliance, however, cannot be placed upon this conclusion, since the stations are not in all cases the same in the three years.

If we look at the London stations which have been in continuous operation during the three years, we find that out of the eight stations six show a diminished deposit in the winter of 1916–17 as compared with 1915–16, one an increased deposit, and one unchanged. In the comparison of the two previous years six showed an increased deposit in 1915-16 as compared with 1914-15, one a diminished deposit, and one unchanged; this is a distinct improvement, but applies only to the winter months.

Again, considering Glasgow stations, of which there are nine, the whole of these show a diminished deposit in the winter months of 1916-17 as compared with 1915-16, whereas in the comparison of

TABLE II.—*Comparison of Monthly Means for all Stations for the Half Years, April to September, 1915 and 1916.*

Station.	April to September.	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Exeter	1915	46	0·02	1·30	3·07	1·01	2·23	7·63	0·95	0·22	0·02	6
	1916	52	0·01	1·23	3·37	1·08	2·78	8·47	1·07	0·29	0·03	6
Leicester	1915	65	0·05	2·61	4·69	2·38	2·51	12·24	1·30	0·30	0·10	5
	1916	42	0·11	3·26	4·27	1·40	2·59	11·63	1·18	0·39	0·14	6
London:—												
Meteorological Office	1915	62	0·09	0·72	2·84	2·82	3·70	10·08	1·65	0·72	0·08	6
	1916	55	0·06	1·89	3·95	1·37	3·82	11·06	1·41	0·67	0·07	6
Embankment Gardens	1915	55	0·41	5·04	8·38	2·79	6·89	23·50	2·74	1·21	0·13	6
	1916	32	0·27	5·40	8·39	2·34	4·41	20·81	2·10	0·51	0·13	4
Finsbury Park	1915	48	0·13	1·85	6·16	0·84	2·60	11·59	1·20	0·34	0·03	6
	1916	58	0·12	1·75	7·30	1·25	3·48	13·90	1·55	0·29	0·04	6
Ravenscourt Park	1915	52	0·07	1·42	4·51	1·05	2·95	9·99	1·46	0·30	0·09	6
	1916	57	0·15	1·95	5·06	1·41	4·40	12·97	1·89	0·32	0·11	6
Southwark Park	1915	56	0·12	2·56	6·85	1·93	5·24	16·71	2·98	0·53	0·11	6
	1916	44	0·06	2·89	7·60	1·67	4·05	16·27	2·05	0·38	0·08	6
Victoria Park	1915	50	0·07	1·51	4·62	1·94	4·18	12·32	2·17	0·50	0·10	6
	1916	41	0·07	1·99	5·79	1·70	3·69	13·24	2·28	0·39	0·09	6
Wandsworth Common	1915	39	0·05	0·90	3·48	0·72	4·69	9·83	—*	—*	—*	6
	1916	34	0·02	1·26	4·78	1·42	3·12	10·56	1·34	0·31	0·05	6
Golden Lane	1915	64	0·06	3·06	4·70	1·74	3·65	13·22	2·05	0·64	0·18	6
	1916	56	0·07	2·33	3·54	1·97	3·23	11·14	2·06	0·59	0·22	6
Malvern	1915	53	0·00	0·22	0·34	0·44	0·68	1·69	0·32	0·17	0·02	4
	1916	41	0·00	0·18	0·28	0·41	0·99	1·87	0·49	0·10	0·02	6
Manchester:—												
Queen's Park	1915	64	0·06	2·21	4·55	2·04	5·75	14·61	2·79	0·69	0·05	6
	1916	61	—	—	—	—	—	13·83	—	—	—	6
School of Technology	1915	60	0·16	3·04	9·71	1·50	4·85	19·26	2·39	0·63	0·08	6
	1916	56	—	—	—	—	—	20·42	—	—	—	6
Newcastle-on-Tyne	1915	24	0·13	2·75	6·87	1·08	2·79	13·63	1·38	0·28	0·09	6
	1916	52	0·29	4·19	9·52	1·85	4·77	20·62	2·28	0·40	0·08	5
York	1915	26	0·06	1·05	2·78	0·81	1·38	6·09	0·64	0·23	0·06	6
	1916	44	0·25	0·99	2·44	1·46	3·06	8·04	1·24	0·34	0·04	6
Coatbridge	1915	53	0·10	1·77	4·45	1·10	1·97	9·39	1·15	0·21	0·10	6
	1916	79	0·09	1·46	4·01	1·43	3·66	10·65	1·62	0·41	0·13	6
Glasgow:—												
Alexandra Park	1915	51	0·13	1·88	3·50	3·89	3·19	12·60	3·37	0·30	0·22	6
	1916	75	0·11	1·74	2·76	3·67	5·87	14·15	3·40	0·38	0·25	6
Bellahouston Park	1915	46	0·58	1·40	2·52	0·78	1·92	7·21	1·03	0·16	0·06	6
	1916	78	0·06	1·14	2·05	1·85	3·07	8·16	1·88	0·18	0·12	6
Blythswood Square	1915	52	0·13	1·64	3·73	2·01	4·34	11·85	2·46	0·21	0·18	6
	1916	74	0·23	3·25	7·76	3·20	4·80	19·25	3·18	0·23	0·15	6
Botanic Gardens	1915	49	0·41	1·89	2·83	1·13	2·51	8·77	1·39	0·14	0·06	6
	1916	83	0·08	1·27	1·80	2·63	4·59	10·38	2·39	0·24	0·13	6
Richmond Park	1915	51	0·12	1·61	3·39	1·79	3·01	9·94	1·56	0·15	0·14	6
	1916	82	0·09	1·41	2·72	2·14	4·13	10·48	2·59	0·22	0·17	6
Ruchill Park	1915	57	0·15	1·60	3·58	1·63	4·27	11·25	2·29	0·15	0·11	6
	1916	81	0·08	1·39	2·98	2·13	3·83	10·42	2·54	0·19	0·17	6
South Side Park	1915	52	0·10	1·05	2·46	1·15	2·15	6·93	1·34	0·13	0·08	6
	1916	82	0·09	0·85	1·80	1·92	3·26	7·93	1·92	0·18	0·13	6
Tollcross Park	1915	52	0·16	2·69	4·50	1·51	4·52	13·39	1·70	0·15	0·09	6
	1916	80	0·08	1·34	3·00	2·51	4·54	11·46	2·45	0·21	0·14	6
Victoria Park	1915	59	0·16	1·26	2·75	2·17	2·92	9·28	1·92	0·15	0·19	6
	1916	86	0·08	0·81	1·34	2·95	3·94	9·12	2·67	0·18	0·22	6
Greenock	1915	54	0·05	2·66	5·00	1·60	2·85	12·17	1·38	0·41	0·12	6
	1916	75	0·20	2·33	4·88	1·74	3·75	12·90	1·79	0·23	0·14	6
Leith	1915	56	0·05	1·26	3·34	2·08	2·63	9·36	1·13	0·23	0·11	6
	1916	64	0·06	1·03	1·96	2·36	4·16	9·56	1·88	0·29	0·07	2

* Results unreliable.

TABLE III.—*Comparison of Monthly Means for all Stations for Half Years, October to March, 1915–16 and 1916–17.*

Station.	October to March.	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	1915–16	82	0·22	3·89	4·96	3·52	4·72	17·31	2·31	0·58	0·23	5
	1916–17	43	0·10	3·20	5·70	1·29	2·66	12·95	1·43	0·39	0·15	6
London :—												
Meteorological Office ...	1915–16	69	0·13	2·43	4·97	2·70	6·75	16·99	2·46	1·06	0·09	6
	1916–17	54	0·10	2·07	3·85	2·75	3·34	12·06	1·53	0·97	0·05	6
Embankment Gardens	1915–16	63	0·35	4·05	7·53	2·58	7·67	22·17	3·58	1·22	0·09	4
	1916–17	32	0·51	3·41	8·52	2·30	4·86	19·59	2·37	0·59	0·05	6
Finsbury Park	1915–16	71	0·20	1·88	5·93	1·36	4·64	14·01	2·01	0·56	0·05	6
	1916–17	49	0·10	1·54	4·61	2·66	5·17	14·08	3·10	0·50	0·04	6
Ravenscourt Park ...	1915–16	71	0·10	2·04	4·57	1·68	5·47	13·86	2·78	0·45	0·09	5
	1916–17	63	0·23	1·99	4·90	3·19	6·13	16·42	3·39	0·68	0·09	6
Southwark Park	1915–16	69	0·16	3·64	7·32	2·65	7·08	20·85	2·98	0·76	0·10	6
	1916–17	49	0·15	2·75	5·38	3·53	6·42	18·23	3·61	0·90	0·07	6
Victoria Park	1915–16	57	0·05	1·11	4·45	2·42	7·05	15·07	3·52	0·61	0·06	6
	1916–17	39	0·03	1·50	3·74	2·06	5·66	12·99	3·18	0·54	0·06	1
Wandsworth Common	1915–16	59	0·07	1·05	3·01	0·91	3·37	8·40	1·57	0·57	0·03	5
	1916–17	30	0·03	0·76	2·41	1·16	2·76	7·11	1·43	0·31	0·02	3
Golden Lane	1915–16	74	0·08	3·39	4·85	3·17	4·89	16·37	3·03	0·88	0·24	6
	1916–17	53	0·07	2·49	3·45	1·83	4·21	12·04	2·03	0·91	0·18	6
Malvern	1915–16	52	0·00	0·08	0·18	0·55	1·15	1·96	0·52	0·22	0·01	3
	1916–17	41	0·01	0·23	0·79	0·80	2·18	4·02	0·78	0·25	0·01	3
Manchester :—												
Queen's Park	1915–16	55	—	—	—	—	—	16·78	—	—	—	4
	1916–17	62	—	—	—	—	—	14·41	—	—	—	6
School of Technology ...	1915–16	60	—	—	—	—	—	22·95	—	—	—	4
	1916–17	58	—	—	—	—	—	18·87	—	—	—	6
Newcastle-on-Tyne	1915–16	69	0·28	4·46	7·73	2·39	5·16	20·03	2·53	0·78	0·17	6
	1916–17	64	0·28	4·66	11·36	3·04	6·50	25·83	2·66	1·97	0·10	6
York	1915–16	49	0·15	1·38	2·49	2·60	3·14	9·76	1·75	0·64	0·09	6
	1916–17	50	0·08	1·01	1·69	3·13	4·25	8·97	2·33	0·76	0·05	5
Coatbridge	1915–16	61	0·08	1·65	3·65	1·51	3·64	10·53	1·63	0·57	0·12	6
	1916–17	70	0·20	2·29	5·93	2·02	4·11	14·55	2·04	0·47	0·16	6
Glasgow :—												
Alexandra Park	1915–16	77	0·26	1·89	2·27	6·09	8·10	18·62	3·70	1·05	0·20	5
	1916–17	71	0·12	1·60	3·06	3·12	5·18	13·06	3·09	0·43	0·20	6
Bellahouston Park ...	1915–16	89	0·21	1·09	1·88	4·60	5·76	13·55	3·34	1·04	0·09	5
	1916–17	77	0·11	1·83	2·25	2·47	4·91	11·57	3·06	0·49	0·10	6
Blythswood Square ...	1915–16	90	0·31	2·42	3·28	4·39	7·38	18·08	4·45	0·88	0·19	6
	1916–17	76	0·16	2·45	3·14	2·90	5·28	13·76	2·76	0·82	0·16	6
Botanic Gardens	1915–16	101	0·29	1·96	3·12	6·36	8·20	19·93	5·16	1·26	0·16	5
	1916–17	92	0·21	2·49	3·49	4·26	8·28	18·74	4·28	0·48	0·15	6
Richmond Park	1915–16	94	0·32	1·60	3·03	5·57	6·87	17·38	4·73	0·89	0·25	5
	1916–17	78	0·12	1·36	2·91	2·28	5·09	11·77	3·59	0·38	0·18	6
Ruchill Park	1915–16	99	0·23	1·41	2·38	4·60	6·52	15·15	2·94	0·81	0·15	5
	1916–17	76	0·17	1·30	2·51	2·57	6·47	13·02	2·62	0·42	0·14	6
South Side Park	1915–16	95	0·22	1·37	2·24	4·07	5·61	13·52	3·90	0·85	0·14	5
	1916–17	76	0·10	0·93	2·15	2·06	4·30	9·55	2·42	0·35	0·11	6
Tollcross Park	1915–16	91	0·26	1·58	2·77	5·00	7·01	16·63	4·25	0·86	0·15	5
	1916–17	77	0·15	1·39	2·54	2·58	4·90	11·56	3·11	0·42	0·17	6
Victoria Park	1915–16	95	0·41	1·24	1·96	5·48	6·89	15·99	4·03	0·94	0·30	5
	1916–17	82	0·10	1·19	2·39	2·89	4·71	11·28	2·77	0·35	0·26	6
Greenock	1915–16	99	0·14	2·30	3·95	2·25	4·78	13·44	2·12	1·19	0·19	6
	1916–17	171	0·32	2·71	4·26	3·04	6·51	16·84	2·99	1·11	0·22	3

TABLE IV.—*Comparison of Monthly Means for Summer and Winter Months of the Year.*

Station.	Summer and winter months, 1916-17.	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for average.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	Apl.-Sep.	42	0·11	3·26	4·27	1·40	2·59	11·63	1·18	0·39	0·14	6
	Oct.-Mch.	43	0·10	3·20	5·70	1·29	2·66	12·95	1·43	0·39	0·15	6
London:—												
Meteorological Office	Apl.-Sep.	55	0·06	1·89	3·95	1·37	3·82	11·06	1·41	0·57	0·07	6
	Oct.-Mch.	54	0·10	2·07	3·85	2·75	3·34	12·06	1·53	0·97	0·05	6
Embankment Gardens	Apl.-Sep.	32	0·27	5·40	8·39	2·34	4·41	20·81	2·10	0·51	0·13	4
	Oct.-Mch.	32	0·51	3·41	8·52	2·30	4·86	19·59	2·37	0·59	0·05	6
Finsbury Park	Apl.-Sep.	58	0·12	1·75	7·30	1·25	3·48	13·90	1·55	0·29	0·04	6
	Oct.-Mch.	49	0·10	1·54	4·61	2·66	5·17	14·08	3·10	0·50	0·04	6
Ravenscourt Park	Apl.-Sep.	57	0·15	1·95	5·06	1·41	4·40	12·97	1·89	0·32	0·11	6
	Oct.-Mch.	63	0·23	1·99	4·90	3·19	6·13	16·42	3·39	0·68	0·09	6
Southwark Park	Apl.-Sep.	44	0·06	2·89	7·60	1·67	4·05	16·27	2·05	0·38	0·08	6
	Oct.-Mch.	49	0·15	2·75	5·38	3·53	6·42	18·23	3·61	0·90	0·07	5
Victoria Park	Apl.-Sep.	41	0·07	1·99	5·79	1·70	3·69	13·24	2·28	0·39	0·09	6
	Oct.-Mch.	39	0·03	1·50	3·74	2·06	5·66	12·99	3·18	0·54	0·06	1
Wandsworth Common	Apl.-Sep.	34	0·02	1·26	4·78	1·42	3·12	10·56	1·34	0·31	0·05	6
	Oct.-Mch.	30	0·03	0·76	2·41	1·16	2·76	7·11	1·43	0·31	0·02	3
Golden Lane	Apl.-Sep.	56	0·07	2·33	3·54	1·97	3·23	11·14	2·06	0·59	0·22	6
	Oct.-Mch.	53	0·07	2·49	3·45	1·83	4·21	12·04	2·03	0·91	0·18	6
Malvern	Apl.-Sep.	41	0·00	0·18	0·28	0·41	0·99	1·87	0·49	0·10	0·02	6
	Oct.-Mch.	41	0·01	0·23	0·79	0·80	2·18	4·02	0·78	0·25	0·01	3
Manchester:—												
Queen's Park	Apl.-Sep.	61	—	—	—	—	—	13·83	—	—	—	6
	Oct.-Mch.	62	—	—	—	—	—	14·41	—	—	—	6
School of Technology	Apl.-Sep.	56	—	—	—	—	—	20·42	—	—	—	6
	Oct.-Mch.	58	—	—	—	—	—	18·87	—	—	—	6
Newcastle-on-Tyne	Apl.-Sep.	52	0·29	4·19	9·52	1·85	4·77	20·62	2·28	0·40	0·08	5
	Oct.-Mch.	64	0·28	4·66	11·36	3·04	6·50	25·83	2·66	1·97	0·10	6
Rochdale	Apl.-Sep.	71	0·16	7·99	14·32	—	—	29·57	—	—	—	6
	Oct.-Mch.	104	0·18	4·89	7·80	—	—	19·18	—	—	—	6
York	Apl.-Sep.	44	0·25	0·99	2·44	1·46	3·06	8·04	1·24	0·34	0·04	6
	Oct.-Mch.	50	0·08	1·01	1·69	3·13	4·25	8·97	2·33	0·76	0·05	5
Coatbridge	Apl.-Sep.	79	0·09	1·46	4·01	1·43	3·66	10·65	1·62	0·41	0·13	6
	Oct.-Mch.	70	0·20	2·29	5·93	2·02	4·11	14·55	2·04	0·47	0·16	6
Glasgow:—												
Alexandra Park	Apl.-Sep.	75	0·11	1·74	2·76	3·67	5·87	14·15	3·40	0·38	0·25	6
	Oct.-Mch.	71	0·12	1·60	3·06	3·12	5·18	13·06	3·09	0·43	0·20	6
Bellahouston Park	Apl.-Sep.	78	0·06	1·14	2·05	1·85	3·07	8·16	1·88	0·18	0·12	6
	Oct.-Mch.	77	0·11	1·83	2·25	2·47	4·91	11·57	3·06	0·49	0·10	6
Blythswood Square	Apl.-Sep.	74	0·23	3·25	7·76	3·20	4·80	19·25	3·18	0·23	0·15	6
	Oct.-Mch.	76	0·16	2·45	3·14	2·90	5·28	13·76	2·76	0·82	0·16	6
Botanic Gardens	Apl.-Sep.	83	0·08	1·27	1·80	2·63	4·59	10·38	2·39	0·24	0·13	6
	Oct.-Mch.	92	0·21	2·49	3·49	4·26	8·28	18·74	4·28	0·48	0·15	6
Richmond Park	Apl.-Sep.	82	0·09	1·41	2·72	2·14	4·13	10·48	2·59	0·22	0·17	6
	Oct.-Mch.	78	0·12	1·36	2·91	2·28	5·09	11·77	3·59	0·38	0·18	6
Ruchill Park	Apl.-Sep.	81	0·08	1·39	2·98	2·13	3·83	10·42	2·54	0·19	0·17	6
	Oct.-Mch.	76	0·17	1·30	2·51	2·57	6·47	13·02	2·62	0·42	0·14	6
South Side Park	Apl.-Sep.	82	0·09	0·85	1·80	1·92	3·26	7·93	1·92	0·18	0·13	6
	Oct.-Mch.	76	0·10	0·93	2·15	2·06	4·30	9·55	2·42	0·35	0·11	6
Tollcross Park	Apl.-Sep.	80	0·08	1·34	3·00	2·51	4·54	11·46	2·45	0·21	0·14	6
	Oct.-Mch.	77	0·15	1·39	2·54	2·58	4·90	11·56	3·11	0·42	0·17	6
Victoria Park	Apl.-Sep.	86	0·08	0·81	1·34	2·95	3·94	9·12	2·67	0·18	0·22	6
	Oct.-Mch.	82	0·10	1·19	2·39	2·89	4·71	11·28	2·77	0·35	0·26	6
Greenock	Apl.-Sep.	75	0·20	2·33	4·88	1·74	3·75	12·90	1·79	0·23	0·14	6
	Oct.-Mch.	171	0·32	2·71	4·26	3·04	6·51	16·84	2·99	1·11	0·22	3

the two previous years four out of the nine show an increased deposit in 1915-16 as compared with 1914-15.

If we compare the mean monthly total deposit in London, using the mean of the eight observing stations, for the summer of 1915-16, this amounted to 13·41 metric tons per square kilometre, whereas in 1916-17 it was 13·74. In the winter months, October to March, the mean monthly deposit for London was in 1915-16 15·97 metric tons per square kilometre, and in 1916-17 14·07, showing a marked decrease in the latter year. The mean monthly deposit for the whole year in London in 1915-16 was 14·69, and in 1916-17 13·90. This represents a diminution of total deposit amounting to 5 per cent.

In Tables II. and III. the summer and winter deposits for each station are compared for the two years 1915-16 and 1916-17. The figures given in these tables are mean monthly deposits, and in each case the number of months used for obtaining the mean is given in the right-hand column. In Tables V. and VI. the different stations are classified under the letters A, B, C, and D, the units used being, as already stated, the same as in the Committee's Second Report. Again, in Tables VII. and VIII., which are prepared from the results of 23 stations working over the whole period, the classified letters are totalled, Table VII. giving the total for the summer months 1915 and 1916, and Table VIII. for the winter for the years 1915-16 and 1916-17.

The classification is made on the monthly means for the six months of summer and winter. Referring, for example, to Table VII. where opposite Tar for 1915 the number of A's given is two; this means that during the summer months of 1915 there were only two stations out of 23 in which the mean monthly deposit of tar fell below 0·05 metric ton per square kilometre; similarly the 15 B's mean that there were 15 stations out of the 23 considered in which the deposit of tar fell between 0·05 and 0·15 metric ton per square kilometre.

Tables VII. and VIII. have been further reduced by the addition of the A's and B's together, and the C's and D's; the results of this addition are given

TABLE V.—*Classification.*

April–September, 1916. Station.	No. of months.	Rainfall in mm.	Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.	Total solids.	Sulphuric acid.	Chlorine.	Ammonia.	Summary.			
Unit for classification...	—	—	0·05	1	2	0·75	1·5	5	1	0·3	0·05	A	B	C	D
Exeter	6	52	A†	B	B	B	B	B	B	A	A†	3	6	0	0
Leicester...	6	42	B	C	B	B	B	B	B	B	B	0	8	1	0
London :—															
Meteorological Office	6	55	B	B	B	B	B	B	B	B	B	0	9	0	0
Embankment Gardens	4	32	D†	D	C	C	B	C	B	B	B	0	4	3	2
Finsbury Park... ...	6	58	B	B	C	B	B	B	B	A	A	2	6	1	0
Ravenscourt Park ...	6	57	C	B	B	B	B	B	B	B	B	0	8	1	0
Southwark Park ...	6	44	B	B	C	B	B	C	B	B	B	0	7	2	0
Victoria Park	6	41	B	B	B	B	B	B	B	B	B	0	9	0	0
Wandsworth Common	6	34	A	B	B	B	B	B	B	B	B	1	8	0	0
Golden Lane	6	56	B	B	B	B	B	B	B	B	C	0	8	1	0
Malvern	6	41	A*	A*	A*	A*	A*	A*	A*	A*	A*	9	0	0	0
Manchester :—															
Queen's Park	6	61	—	—	—	—	—	B	—	—	—	—	1	—	—
School of Technology	6	56	—	—	—	—	—	C	—	—	—	—	—	1	—
Newcastle-on-Tyne ...	5	52	D*	C	C	B	C	C	B	B	B	0	4	4	1
Rochdale...	6	71	C	D*	D*	—	—	D*	—	—	—	—	—	—	—
York...	6	44	D	A	B	B	B	B	B	B	A	2	6	0	1
Coatbridge	6	79	B	B	B	B	B	B	B	B	B	0	9	0	0
Glasgow :—															
Alexandra Park ...	6	75	B	B	B	C	C	B	C	B	D*	0	5	3	1
Bellahouston Park...	6	78	B	B	B	B	B	B	B	B	B	0	9	0	0
Blythswood Square...	6	74	C	C	C	C	C	C	C	A	C	1	0	8	0
Botanic Gardens ...	6	83	B	B	A	C	C	B	B	A	B	2	5	2	0
Richmond Park ...	6	82	B	B	B	B	B	B	B	A	C	1	7	1	0
Ruchill Park	6	81	B	B	B	B	B	B	B	A	C	1	7	1	0
South Side Park ...	6	82	B	A	A	B	B	B	B	A	B	3	6	0	0
Tollcross Park... ...	6	80	B	B	B	C	C	B	B	A	B	1	6	2	0
Victoria Park	6	86	B	A	A	C	B	B	B	A	C	3	4	2	0
Greenock...	6	75	C	B	B	B	B	B	B	A	B	1	7	1	0
Leith...	2	64	B	B	A	C	B	B	B	A	B	2	6	1	0

* Indicates the letters representing the highest and lowest records for each element in the list of stations.

† Indicates the second (if there is one) in Class A or Class D.

below for the two years 1915-16 and 1916-17, keeping the summer and winter months separate:—

Comparison of 1915–16 with 1916–17.

			April to Sept. (23 stations).		Oct. to March (23 stations).	
			A & B.	C & D.	A & B.	C & D.
	Total solids ...	1915–1916	21	2	8	15
		1916–1917	19	4	17	6
Insoluble.	Tar	1915–1916	17	6	8	15
		1916–1917	17	6	13	10
	Carbonaceous other than tar...	1915–1916	21	2	18	5
		1916–1917	19	4	20	3
	Ash...	1915–1916	19	4	20	3
		1916–1917	18	5	21	2
Soluble.	Loss on ignition..	1915–1916	20	3	5	18
		1916–1917	17	6	8	15
	Ash...	1915–1916	20	3	4	19
		1916–1917	18	5	8	15
	Sulphates	1915–1916	22	1	12	11
		1916–1917	21	2	14	9
	Chlorine	1915–1916	22	1	15	8
		1916–1917	23	0	18	5
	Ammonia	1915–1916	19	4	12	11
		1916–1917	17	6	13	10

As explained in the Second Report, we may now use the figures representing the sum of the A's and B's and the C's and D's to compare the quantity deposited in the periods under consideration; also, the two columns being complementary, we need only study one, say the C and D column. This will be more convenient to examine since the increase in the figure for C and D indicates a greater deposit, and reduction of the figure a less deposit, when comparing the two periods.

Comparing now the C and D column for the summer of 1915 with that for the summer of 1916 we note that the following show increased deposit in the summer of 1916:—Total Solids, Insoluble Carbonaceous Matter, Insoluble Ash, Soluble Loss on Ignition and Ash, Sulphates and Ammonia. The only reduced deposit being Chlorine, while Tar is the same for the two periods.

If now we compare the winter months of the same two years, we find that the state of affairs is practically reversed, as a reduction in the amount of deposit is shown in every case.

This corresponds with the conclusion already indicated when comparing the stations showing a reduced or increased deposit in the two years. We therefore conclude that the summer of 1916-17

TABLE VI.—*Classification.*

October–March, 1916–17. Station.	No. of months.	Rainfall in mm.	Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.	Total solids.	Sulphuric acid.	Chlorine.	Ammonia.	Summary.			
Unit for classification	—	—	0·05	1	2	0·75	1·5	5	1	0·3	0·05	A	B	C	D
Leicester	6	43	B	C	B	B	B	B	B	B	C	0	7	2	0
London:—															
Meteorological Office	6	54	B	B	B	C	B	B	B	C	B	0	7	2	0
Embankment Gardens	6	32	D*	C	C	C	C	C	B	B	B	0	3	5	1
Finsbury Park	6	49	B	B	B	C	C	B	C	B	A	1	5	3	0
Ravenscourt Park ...	6	63	C	B	B	C	C	C	C	B	B	0	4	5	0
Southwark Park ...	5	49	C	B	B	C	C	C	C	C	B	0	3	6	0
Victoria Park	1	39	A	B	B	B	C	B	C	B	B	1	6	2	0
Wandsworth Common	3	30	A†	A†	B	B	B	B	B	B	A†	3	6	0	0
Golden Lane	6	53	B	B	B	B	B	B	B	C	C	0	7	2	0
Malvern	3	41	A*	A*	A*	B	B	A*	A*	A*	A*	7	2	0	0
Manchester:—															
Queen's Park	6	62	—	—	—	—	—	B	—	—	—	0	1	0	0
School of Technology	6	58	—	—	—	—	—	C	—	—	—	0	0	1	0
Newcastle-on-Tyne ...	6	64	D	C	D*	C	C	D†	B	D†	B	0	2	3	4
Rochdale...	6	104	C	C	C	—	—	C	—	—	—	0	0	4	0
St. Helens	3	72	D†	D*	C	C	D*	D*	D*	D*	D*	0	0	2	7
York	5	50	B	B	A†	C	B	B	B	B	B	1	7	1	0
Coatbridge	6	70	C	B	B	B	B	B	B	B	C	0	7	2	0
Glasgow:—															
Alexandra Park ...	6	71	B	B	B	C	C	B	C	B	C	0	5	4	0
Bellahouston Park ...	6	77	B	B	B	C	C	B	C	B	B	0	6	3	0
Blythswood Square...	6	76	C	B	B	C	C	B	B	B	C	0	5	4	0
Botanic Gardens ...	6	92	C	B	B	D*	D†	C	C	B	C	0	3	4	2
Richmond Park ...	6	78	B	B	B	C	C	B	C	B	C	0	5	4	0
Ruchill Park	6	76	C	B	B	C	C	B	B	B	B	0	6	3	0
South Side Park ...	6	76	B	A	B	B	B	B	B	B	B	1	8	0	0
Tollcross Park	6	77	C	B	B	C	C	B	C	B	C	0	4	5	0
Victoria Park	6	82	B	B	B	C	C	B	B	B	D†	0	6	2	1
Greenock...	3	171	D	B	B	B	C	C	B	C	C	0	4	4	1

* Indicates the letters representing the highest and lowest records for each element in the list of stations.
† Indicates the second (if there is one) in Class A or Class D.

TABLE VII.—*Totals of Classes A, B, C, D for Each Element of Pollution for Two Half Years, April–September, 1915 and 1916, for 23 Stations.*

TABLE VIII.—*Totals of Classes A, B, C, D for Each Element of Pollution for Two Half Years, October–March, 1915–16 and 1916–17, for 23 Stations.*

TABLE VII.

	—	—	A	B	C	D
	Total solids	1915	1	20	2	0
		1916	1	18	4	0
Insoluble.	Tar	1915	2	15	3	3
		1916	2	15	3	3
	Carbonaceous other than tar	1915	2	19	1	1
		1916	4	15	2	1
	Ash	1915	1	18	4	0
		1916	4	14	5	0
Soluble.	Loss on ignition	1915	1	19	3	1
		1916	1	16	6	0
	Ash	1915	2	18	3	0
		1916	1	17	5	0
	Sulphuric acid	1915	3	19	1	0
		1916	1	20	2	0
	Chlorine	1915	13	9	1	0
		1916	11	12	0	0
	Ammonia	1915	3	16	4	0
		1916	3	14	5	1

TABLE VIII.

	—	—	A	B	C	D
	Total solids	1915–16	1	7	15	0
		1916–17	1	16	5	1
Insoluble.	Tar	1915–16	1	7	7	8
		1916–17	3	10	7	3
	Carbonaceous other than tar	1915–16	1	17	5	0
		1916–17	3	17	3	0
	Ash	1915–16	3	17	3	0
		1916–17	2	19	1	1
Soluble.	Loss on ignition	1915–16	1	4	9	9
		1916–17	0	8	14	1
	Ash	1915–16	1	3	15	4
		1916–17	0	8	14	1
	Sulphuric acid	1915–16	1	11	10	1
		1916–17	1	13	9	0
	Chlorine	1915–16	1	14	8	0
		1916–17	1	17	4	1
	Ammonia	1915–16	2	10	9	2
		1916–17	3	10	9	1

List of Stations used in Table VII.

Exeter.
Leicester.
London:—
Meteorological Office.
Embankment Gardens.
Finsbury Park.
Ravenscourt Park.
Southwark Park.
London—(*Continued*):—
Victoria Park.
Golden Lane.
Malvern.
Newcastle-on-Tyne.
York.
Coatbridge.
Glasgow:—
Alexandra Park, Bellahouston Park, Blythswood Square, Botanic Gardens, Richmond Park, Ruchill Park, South Side Park, Tollcross Park, Victoria Park.
Greenock.

Names of 23 Stations used in Table VIII.

Leicester.
London:—
Meteorological Office.
Embankment Gardens.
Finsbury Park.
Ravenscourt Park.
Southwark Park.
Victoria Park.
London—(*Continued*):—
Wandsworth Common.
Golden Lane.
Malvern.
Newcastle-on-Tyne.
York.
Coatbridge.
Glasgow:—
Alexandra Park, Bellahouston Park, Blythswood Square, Botanic Gardens, Richmond Park, Ruchill Park, South Side Park, Tollcross Park, Victoria Park.
Greenock.

TABLE IX.—*Average Deposit of Each Element of Pollution for Each Month for Selected Group of 18 Stations April, 1916–March, 1917. Also Deposit per 100 Millimetres of Rainfall in Ton per K².*

	—	1916									1917			Ratio Max. / Min.
		April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	
	Rainfall in mm., average	70	90	61	71	95	34	117	83	89	52	24	48	4·9
	Total Solids, average	13·66	15·49	13·61	11·52	13·99	10·56	16·19	13·75	18·73	10·21	9·93	14·13	1·89
	,, ,, per 100 mm. rain	19·52	12·20	22·34	16·24	14·77	31·10	13·84	16·60	21·10	19·65	41·40	29·48	2·99
Insoluble.	Tar, average	0·11	0·13	0·13	0·08	0·08	0·10	0·14	0·13	0·19	0·11	0·11	0·14	2·38
	,, per 100 mm. rain	0·157	0·145	0·21	0·11	0·084	0·29	0·12	0·16	0·24	0·21	0·46	0·29	5·50
	Carbonaceous matter, aver.	2·20	2·34	2·21	1·17	2·17	1·98	2·10	1·84	2·78	1·54	1·56	2·56	2·37
	,, per 100 mm. rain	3·14	2·60	3·62	1·65	2·29	5·83	1·80	2·22	3·13	2·96	6·50	5·33	3·94
	Ash, average	3·54	5·27	4·76	3·46	5·10	3·61	3·91	3·16	4·58	3·55	3·06	5·43	1·77
	,, per 100 mm. rain	5·06	5·85	7·81	4·87	5·37	10·62	3·34	3·81	5·15	6·83	12·75	11·32	3·82
Soluble.	Loss on ignition, average	2·67	2·81	2·02	1·70	2·39	1·33	3·39	2·89	3·59	1·88	1·70	2·09	2·70
	,, per 100 mm. rain	3·82	3·12	3·32	2·39	2·52	3·92	2·90	3·48	4·15	3·62	7·09	4·35	2·97
	Ash, average	4·33	5·13	3·66	3·58	4·19	2·77	6·45	5·28	8·02	3·53	3·43	3·85	2·90
	,, per 100 mm. rain	6·20	5·70	6·00	5·05	4·41	8·15	5·51	6·37	9·02	6·79	14·30	8·02	3·25
	SO_3, average	2·37	3·00	1·89	1·89	2·51	1·44	3·07	2·85	4·43	1·99	1·76	2·40	3·08
	,, per 100 mm. rain	3·39	3·34	3·10	2·66	2·65	4·24	2·62	3·44	4·98	3·83	7·34	5·00	2·80
	Chlorine, average	0·46	0·34	0·26	0·19	0·38	0·24	0·74	0·68	0·63	0·54	0·25	0·39	3·90
	,, per 100 mm. rain	0·66	0·38	0·43	0·27	0·40	0·71	0·63	0·87	0·71	1·04	1·04	0·81	3·86
	Ammonia, average	0·19	0·16	0·14	0·16	0·18	0·07	0·24	0·14	0·17	0·11	0·07	0·13	3·43
	,, per 100 mm. rain	0·27	0·18	0·23	0·23	0·19	0·21	0·21	0·17	0·19	0·21	0·29	0·27	1·70

TABLE X.—*Mean Daily Deposit of Each Element of Pollution in Tons per Square Kilometre for Each Month, showing the Average of the Selected Group of 18 Stations.*

		1916.								1917.		
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.
	Rainfall in mm. ...	2·33	2·91	2·03	2·30	3·08	1·13	3·76	2·76	2·86	1·68	0·87	1·53
	Total solids	0·4553	0·4998	0 4536	0·3716	0·4512	0·3521	0·5222	0·4583	0·6043	0·3292	0·3546	0·4559
Insoluble.	Tar	0 0036	0·0041	0·0042	0·0026	0·0024	0·0032	0·0045	0·0043	0·0061	0 0035	0·0040	0·0047
Insoluble.	Carbonaceous matter	0·0732	0·0756	0·0738	0·0572	0·0703	0 0662	0·0676	0·0615	0·0896	0·0497	0·0558	0·0827
Insoluble.	Ash	0·1180	0·1700	0·1588	0·1116	0·1646	0·1205	0·1261	0·1055	0·1476	0·1144	0·1094	0·1752
Soluble.	Loss on ignition...	0·0889	0·0906	0·0673	0 0548	0·0770	0·0442	0·1093	0·0962	0·1159	0·0608	0·0607	0 0675
Soluble.	Ash	0·1446	0·1654	0·1220	0·1154	0·1350	0·0925	0·2080	0·1760	0·2590	0·1140	0·1225	0·1240
	Sulphate (SO_3)...	0·0791	0 0967	0·0630	0·0608	0·0807	0·0480	0·0988	0·0950	0·1410	0·0642	0·0629	0·0775
	Chlorine (Cl)... ...	0·0154	0·0109	0·0087	0 0063	0·0123	0·0081	0·0238	0·0226	0·0203	0 0173	0·0088	0·0127
	Ammonia (NH_3)...	0·0063	0·0051	0·0047	0·0052	0 0059	0·0024	0·0079	0·0047	0·0053	0·0034	0·0025	0·0042

shows an increased deposit over that of the previous year, whereas the winter shows a diminished deposit. In the following list the stations showing the highest and lowest mean monthly deposit for the whole year of 1916-17 are given.

Mean Monthly Deposit, 1916–17, in Tons per Square Kilometre.

	Highest.		Lowest.	
Total solids...	St. Helens	37·67*	Malvern ...	2·58
	Rochdale	24·37	York	8·46
	Newcastle	23·46	Exeter	8·47
Tar...	St. Helens	0·49	Malvern ...	0·00
	London—Embankment Gardens... ...	0·42	Exeter	0·01
			London—Wandsworth Common ...	0·02
Carbonaceous other than tar	Rochdale	6·44	Malvern ...	0·20
	St. Helens	6·37	Glasgow—South Side Park... ...	0·89
Ash (insoluble)	Rochdale	11·06	Malvern ...	0·45
	Newcastle	10·52	Glasgow—Victoria Park... ...	1·86
Loss on ignition	St. Helens	3·53	Malvern ...	0·54
	Glasgow—Botanic Gardens	3 45	Exeter	1·08
Ash (soluble)	St. Helens	17·61	Malvern ...	1·39
	Glasgow—Botanic Gardens	6·43	London—Wandsworth Common ...	2·55
Sulphate ...	St. Helens	6·40	Malvern ...	0·58
	Glasgow—Botanic Gardens	3·24	Exeter	1·07
Chlorine ...	St. Helens	3·09	Malvern ...	0·15
	Newcastle	1·26	Glasgow—South Side Park... ...	0·26
			Victoria Park... ...	0·27
Ammonia ...	St. Helens	0·28	Malvern ...	0·02
	Glasgow—Victoria Park ...	0·24	Exeter	0·03
			London—Finsbury Park... ..	0·04
			Wandsworth Common...	0·04

* Average of three months only. Results unreliable.

Seasonal Variations.

In Table IV. is given a comparison of the mean monthly deposit in 1916-17 for the summer and winter months. This shows that while on the whole the winter deposit is somewhat greater than the summer, the difference is not as much as might be expected.

The following summary gives an analysis of Table IV., the stations being divided into three groups: Column 1, those in which the winter deposit was greater; Column 2, those in which the summer and winter were the same; Column 3, those having a greater summer deposit.

Comparison of Summer and Winter Deposits for Year April, 1916, to March, 1917.

—	Winter deposit greater in:	Deposits equal.	Summer deposit greater in:
	Stations.		Stations.
Rainfall	10	1	11
Total solids...	17	—	5
Insoluble—Tar...	14	1	5
Insoluble—Carbonaceous	11	—	9
Insoluble—Ash...	10	—	10
Soluble—Loss on ignition	13	—	6
Soluble—Ash	17	—	2
Sulphates	16	—	3
Chlorine	18	1	0
Ammonia	9	1	9

Each of the elements considered must be taken separately, as the analyses were not always complete for the total number of stations, and for this reason the total of the numbers given is not always the same, but varies from 19 to 22.

Looking down this list we see that out of 22 stations the rainfall was greater in summer than in winter in 11 cases, a rather curious state of affairs. Total Solids, Tar, Insoluble Carbonaceous, Soluble Loss on Ignition and Ash, Sulphates and Chlorides, all show a predominance of stations having a greater winter deposit, whereas Insoluble Ash and Ammonia are about equally balanced as between summer and winter.

We may examine the incidence of deposit in the different months during the year, referring for this purpose to Table X., which has been prepared by dividing the total deposit in the whole 18 stations for each month by the number of stations and of days in the month, and thus obtaining for each month the average daily deposit of each element

of pollution. Taking the elements in the order given in the table, the months of highest and lowest daily deposit are as given in the following list:—

Months of Highest and Lowest Daily Deposit based on the Average of 18 Stations for the Period April, 1916, to March, 1917.

—		Highest.	Second highest.	Lowest.	Second lowest.
Rainfall ...		Oct.	August	Feb.	Sept.
Total solids		Dec.	Oct.	Jan.	,,
Tar	Insoluble.	,,	March	August	July
Carbonaceous matter...	Insoluble.	,,	,,	Jan.	,,
Ash	Insoluble.	March	May	Nov.	Feb.
Loss on ignition	Soluble.	Dec.	Oct.	Sept.	July
Ash	Soluble.	,,	,,	,,	Jan.
Sulphates	Soluble.	,,	,,	,,	July
Chlorine ...	Soluble.	Oct.	Nov.	July	Sept.
Ammonia..	Soluble.	,,	April	Sept.	Feb.

Relation of Deposits.

In considering the relation of the elements of deposit to each other or to rainfall reference is to be made to Table IX. and to the graphs in Figs. 1 and 2.

Fig. 1 is prepared from Table IX., and shows the average deposits plotted over the corresponding months. The scales used are shown in the margin and are not the same for all deposits owing to the necessity for getting the curves into a reasonable area. Fig. 1 shows graphically the relation between the different elements of deposit. Fig. 2 has been prepared owing to the indications already obtained that there might be some relation between rainfall and deposit of soluble matter, and in order to bring out the nature of the relationship should there be one. This shows the average deposit of soluble and insoluble matter for each month for a group of 18 stations, plotted against the average rainfall for the month. These curves bring out clearly the absence of any relation between the amount of insoluble deposit and the rainfall, but show a distinct indication of a relation between soluble deposit and rainfall. This is not so close as to be very obvious until a large number of stations are averaged as at present.

The table following gives the figures from which Fig. 2 was prepared:—

Dr. J. R. Ashworth, of Rochdale, a member of the Committee, made some experiments bearing on this point, relative to which he says:—

"Out of a number of *daily* observations of the atmospheric deposit (taken in a small funnel) I have selected 16 practically rainless days in May, June, and July, 1914, and compared them with 12 wet days in the same period, with the result that the average insoluble deposit on the dry days is to that on the wet days as 13:15."

The following figures have been prepared from Table IX., which gives the average deposit of each element of pollution for each month for about 18 stations. Out of the 12 months shown on this table the six wettest months were selected and also the six of least rain; the total average deposits of insoluble matter and of soluble matter were added up separately as well as the average rainfalls, with the result shown in the following table:—

Six months of greatest rain.			Six months of least rain.		
Rainfall, mm.	Insoluble, tons/K².	Soluble.	Rainfall, mm.	Insoluble, tons/K².	Soluble.
117	6·15	9·84	70	5·85	7·00
95	7·35	6·58	61	7·10	5·68
90	7·74	7·94	52	5·20	5·41
89	7·55	11·61	48	8·13	5·94
85	5·13	8·17	34	5·69	4·10
71	4·71	5·28	24	4·73	5·13
545	38·63	49·42	289	36·70	33·26

Considering the totals at the bottom of this table the ratio of rainfall in the wet months to that in the drier months was $\frac{545}{289} = 1{\cdot}89$, the ratio of insoluble matter in the two periods was $\frac{38{\cdot}63}{36{\cdot}70} = 1{\cdot}05$, and the ratio of soluble matter was $\frac{49{\cdot}42}{33{\cdot}26} = 1.49$.

From these figures we see that while the rainfall of the two periods was as 1.89 is to 1, the insoluble matter deposited varied only from 1·05 to 1, whereas the soluble matter varied from 1·49 to 1, the higher deposit being in the wetter period. This supports the view that while the amount of insoluble matter deposited is very little affected by the rainfall it has a considerable effect upon the amount of soluble matter deposited.

It will be remembered that in the Committee's Second Report it was shown that there was even a tendency for an inverse relationship between the

Average Deposit of Insoluble and of Soluble Matter for each Month for a Group of 18 Stations. April, 1916—March, 1917.

—	1916.									1917.		
	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Rainfall	70	90	61	71	95	34	117	83	89	52	24	48
Insoluble	5·84	7·74	7·10	5·32	7·36	5·70	6·14	5·14	7·54	5·20	4·73	8·14
Soluble	7·01	7·94	5·67	5·28	6·58	4·10	9·84	8·17	11·61	5·41	5·13	5·94

Leicester.
London:—
Meteorological Office.
Finsbury Park.
Ravenscourt Park.
Golden Lane.

Manchester:—
Queen's Park.
School of Technology.
Rochdale.
Coatbridge.

Glasgow:—
Alexandra Park.
Bellahouston Park.
Blythswood Square.
Botanic Gardens.
Richmond Park.

Glasgow:—
Ruchill Park.
South Side Park.
Tollcross Park.
Victoria Park.

FIG. 1.—CURVES SHOWING AVERAGE DEPOSIT OF EACH ELEMENT OF POLLUTION FOR EACH MONTH FOR SELECTED GROUP OF 18 STATIONS. 1916–17.

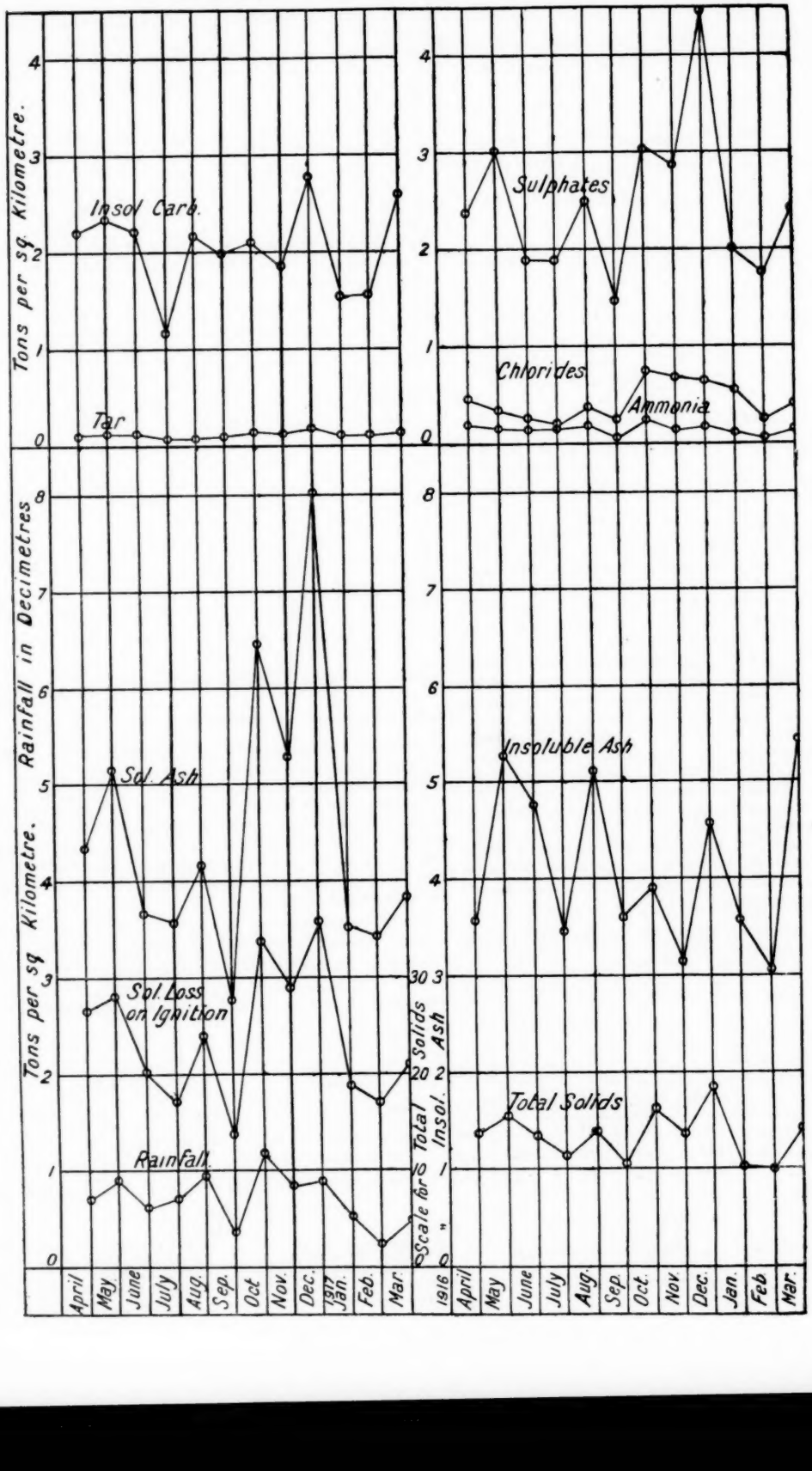
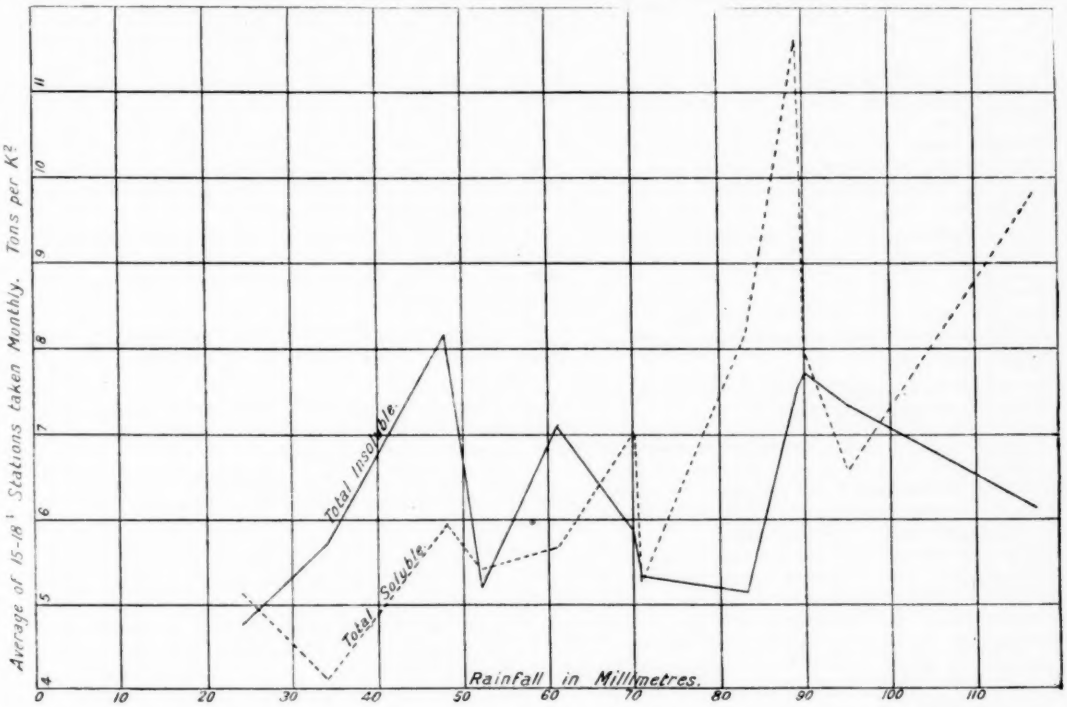


FIG. 2.—AVERAGE DEPOSIT OF SOLUBLE AND INSOLUBLE MATTER EACH MONTH FOR GROUP OF 18 STATIONS, PLOTTED AGAINST AVERAGE MONTHLY RAINFALL.



amount of insoluble inorganic matter deposited and the rainfall. This probably simply means that there is more dust produced in fine than in wet weather.

Turning now to Table IX. and referring to the last column, showing the degree of variation in the figures from month to month, it will be seen that the figures before conversion to the 100 mm. rainfall show less variation than after conversion in all cases except Sulphates, Chlorine, and Ammonia. For example, referring to the Total Solids, the variation in the figures showing the average for each month is from 1 to 1·89, or the highest deposit is about twice the lowest; but when the total deposit is converted to the 100 mm. rainfall standard the variation in the figures obtained is increased, the highest being roughly three times the lowest.

The variation of the figures for soluble deposit is very little affected by the conversion to 100 mm. rainfall. The figures for Soluble Loss on Ignition before conversion to 100 mm. rainfall have the maximum 2·7 times the minimum, while after conversion it was 2·97 times the minimum. Soluble Ash before conversion had a maximum 2·9 times the minimum, after conversion it was 3·25. Comparing these with the figures for insoluble deposit, it will be seen that there is much less difference in the variation before and after conversion to 100 mm. rainfall in the soluble part of the deposit than in the insoluble. All this shows that the deposit of insoluble impurity does not depend upon rainfall, whereas there is some indication that the soluble part of the impurities deposited is influenced by the rainfall.

In examining the column $\frac{\text{Max.}}{\text{Min.}}$ in Table IX. it will be seen that the rainfall variation was from 1 to 4·9, whereas during the previous year it amounted to 1 to 4·4—that is, there was a greater variation in the amount of rain which fell monthly in the year 1916–17 than in 1915–16.

On the other hand, while in the latter year the highest variation in the deposits was found in Insoluble Ash and amounted to 1 to 4·4, in 1916–17 the highest variation was from 1 to 3·9, and occurred in the figures for Chlorine.

Comparing the month of maximum deposit of each of the elements of pollution with that of maximum rainfall we get the following result: The highest rainfall occurred in October, while Total Solids, Insoluble Carbonaceous, Soluble Loss on Ignition, Ash and Sulphates all showed the highest deposit in December, Chlorine and Ammonia being the only ones having the highest deposit in October.

The lowest rainfall was in February and the lowest deposit of Total Solids, Insoluble Ash and Ammonia were also in February; Tar, Insoluble Carbonaceous, and Chlorine had their lowest deposit in July; Soluble Loss on Ignition, Ash, and Sulphates were lowest in September. The minimum rainfall from Table IX. was 24 mm. in February, the next lowest being 34 mm. in September.

In no instance does the highest and lowest deposit correspond with the highest and lowest rainfall. It will be remembered that this comparison is based on the average of 18 stations, so that there would be a tendency to smooth out incidental irregularities and a greater probability of

bringing out the true relationship than if using the results of only a single station.

This is based on the assumption that the law, if there be one, giving the relationship of deposits to rainfall is the same for each station.

A METHOD OF MEASURING SUSPENDED IMPURITY IN THE ATMOSPHERE.

When the Committee for the Investigation of Atmospheric Pollution was appointed at the International Conference on Smoke Abatement in 1911, one of its first duties was to lay down the lines along which the investigation should be made. A meeting was held and the matter fully discussed, when it was decided that the attempt should be made to measure:—

(1) The amount of impurity deposited or washed out of the air by rain on a fixed area and in different places, and to determine the nature of the impurities.

(2) The amount of matter in suspension in the air as distinct from that deposited.

With regard to (1) the Committee's standard deposit gauge now in use at all the stations in England and Scotland answers its purpose admirably; it is with the attempt to solve the second problem that the following is concerned.

It may be mentioned that while the nature and quantity of deposited matter is of great importance from the point of view of injury to buildings and plants, the very finely divided matter which remains in suspension is probably of greater importance from a hygienic point of view. It is the suspended matter which we breathe into our lungs and which cuts off the sunlight.

Several different methods have been proposed or tried for measuring suspended impurity, and these were considered in some detail in a paper read by Dr. Owens before the British Association in 1913. They will therefore only be briefly mentioned here:—

(1) A measured volume of air may be filtered through some medium and the amount of the deposit ascertained by weighing.

(2) Aitken's dust counter, by which the *number* of suspended particles can be counted.

(3) A jet of air of standard size may be caused to strike a glass plate at a fixed distance from the nozzle, and the opacity of plate measured after a definite time; *or* white paper may be used and the discolouration measured.

(4) The opacity of a column of air of given length to a standard light may be measured.

(5) The visibility of objects at fixed distances may be noted and compared from time to time.

(6) The impurities may be washed out of a known volume of air and subsequently collected for weighing and analysis.

The objections to (1) are that it is slow and laborious and, unless large volumes of air are dealt with, the weights of deposit are so small as to make it unreliable.

Method (2) may give the number of particles, but takes no account of their size.

Method (3) gives very rough comparative results, but cannot be considered reliable, as it assumes (*a*) that all the particles strike against the plate or paper, and (*b*) that all striking particles stick.

Methods (4) and (5) are only very rough approximate methods, as the opacity of the air is influenced by water fog as well as dust particles.

As to Method (6), seeing that the object in view is to remove all the impurities present, the method of washing did not appear to promise a sufficiently complete removal to make it effective. In washing, for example, by bubbling through water only the surfaces of the bubbles would be in contact with the water and the resulting cleansing of the air incomplete. Similarly, washing by means of a spray or a scrubber in addition to incomplete cleansing would introduce serious difficulties in recovering the impurities washed out.

In all these methods it must be kept in mind that the quantity of impurity present in the air is so extremely small and finely divided that special difficulties are introduced.

The apparatus which will now be described was devised by Dr. Owens to fulfil the following conditions:—

1. Simplicity of method, so that it would be unnecessary to employ a skilled chemist to take observations.

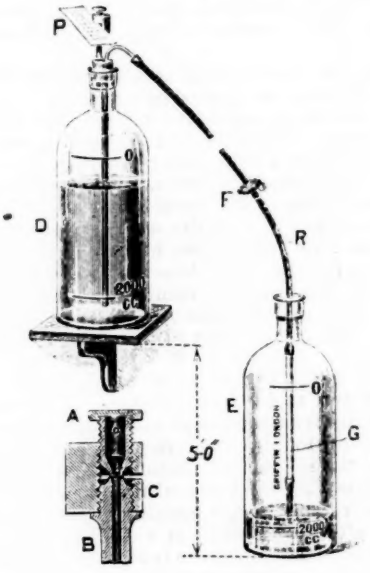
2. Sufficient accuracy to give reliable, comparative, and, if possible, quantitative results.

3. Portability and cheapness of apparatus: as the value would be enhanced if widely used so as to give a large number of results at different places for comparison.

4. Speed of observation, which is a necessity, as the atmospheric conditions, especially in cities, alter very rapidly.

5. Permanence of record for reference purposes.

FIG. 3.



In the method used a measured volume of air is filtered through a disc of special paper of standard size, and the discolouration of the paper is compared with a prepared scale. The apparatus consists of a pair of graduated aspirating bottles, D and E, Fig. 3, one of which is filled with water and placed

on a stand about 5 feet above the other: into this the water is allowed to run through a rubber tube having a clip F, and terminating in the lower bottle in a short length of glass tube, the use of which will be subsequently explained. The filtering apparatus is fixed in a rubber bung in the upper bottle, and consists of a sleeve C bored eccentrically and carrying two screwed plugs, A and B, axially perforated, one screwed in from each end. These plugs meet opposite a slot in the sleeve C, where their ends are faced so as to fit nicely together and grip the filter-paper P, which is inserted through the slot. The hole in these plugs is exactly 1 8 inch in diameter. The upper plug has a milled head, as shown in Fig. 3, and the lower one terminates in a projecting nozzle which fits in a hole in the rubber bung. Thus, all air drawn into the upper bottle must enter through the disc of filter-paper 1 8 inch in diameter.

The standard volume of air used is 2 litres, and marks are put on the bottles to indicate when that amount of water has flowed out: this gives a measure of the volume of air filtered. As, however, the water flows out under a head of about 5 feet, and the air enters somewhat slowly through the filter, a certain time must be allowed after the water has reached the lower mark and the clip F has been closed, before removing the filter-paper. From experience it has been found that about two to three minutes are required for the air in the upper bottle to reach atmospheric pressure; but to avoid error, as soon as the required volume of water has passed out and the clip F has been closed to stop further flow, the lower end of the tube R is lifted and the glass termination G placed beside the upper bottle, in which position it acts as a pressure gauge as soon as clip F is opened, and the water will be seen rising in the glass tube G. When it has reached the same level as the water inside the bottle the filter-paper may be removed.

The whole time of taking an observation from start to finish is about 10 minutes.

The filter-paper is held securely by screwing down plug A gently, and can be released when the record is taken by slacking back the screw. The record given takes the form of a circular discoloured dot 1 8 inch diameter on the white background of the paper, and the degree of the discolouration is a measure of the amount of impurity present in the air. It is obvious that, to be reliable, the filter-paper must catch all the dust particles, and it was only after considerable difficulty that a paper capable of doing this was found. The method of testing the paper used was by placing two discs of paper in tandem in the same filter and drawing the air through both; if the first paper showed discolouration and the second remained white, it was considered a proof of the efficiency of the paper as a trap for the suspended matter. It was found that thin smooth-surfaced filter papers were not satisfactory, as they not only gave a spotty record, but permitted some impurities to pass; the spotty nature of the record was doubtless due to the accumulation of the dust particles near small holes. With thick smooth-surfaced paper the records were perfectly uniformly shaded, and no passage of particles through to the second paper could be detected.

The record papers are printed in the form of oblong slips as shown in Fig. 4, the upper row of squares being intended to receive the records. When filled up the slips can be filed away and kept for future reference.

Scale.—To enable a comparison to be made between the records from different places without having to compare the actual records themselves with each other, a scale of shades has been prepared. This scale is made by superimposing layers of a standard wash of lampblack on a white paper. Ten different shades are provided, numbered 1, 2, 3, 4, 6, 8, 10, 12, 15, and 20, and each number represents so many layers of the standard wash. Thus, having once fixed the unit of shade, the rest represent multiples of that unit. Since the scale is, therefore, numbered strictly in proportion to the amount of lampblack deposited on each shade, it

FIG. 4.—FORM OF RECORD PAPERS.

RECORD									
VOLUME	2 L	2 L							
SHADE No	5	1							
TIME	10 am	10 am							
DATE	9 2 18	10 2 18							
PLACE	London	London							
REMARKS	Foggy	Clear							

follows that when a record is matched with the scale the shade number represents the amount of impurity deposited on the record, referred to some unit. If we can ascertain the value of the unit in terms of the weight of the deposit on the filter-paper we have a ready means of reading directly the actual weight of impurity present in the air, say, in milligrammes per cubic metre. This calibration of the scale required a very great amount of work, and Mr. J. G. Clark kindly undertook to deal with this aspect of the problem.

Application.—With reference to the application of the apparatus, it seems probable that its chief value will lie in the fact that it provides a simple and inexpensive means of measuring the degree of pollution of city air by smoke. It will be observed that the assumption is made that the *colour* of the suspended impurity of different cities is sufficiently alike to make such a method of comparison possible. In exceptional cases this may not be the case, such, e.g., as in the neighbourhood of cement works, refuse destructors, and other sources of light-coloured smoke; but this point is probably not of great importance, as the sources of city impurity are very much the same on the whole. The Committee hope, however, to arrange for some experiments on this point.

The records from different towns can be compared. For example, records can be kept on forms such as shown in Fig. 5, or the shade numbers might be plotted in the form of a curve as in Fig. 6, so as to show graphically the variation in impurity presented from time to time. Thus the results of efforts to economise fuel by abating smoke would be seen.

Such a curve as Fig. 6 represents within the limits of error of the method the actual variation in the amount of impurity in the air, since the shade numbers which are plotted as ordinates are directly proportioned to the amount of impurity (see data *re* calibration); indeed, the same curve may be made to read on another scale, such as shown on the right-hand side, the amount of pollution in mg. per cu.m.

FIG. 5.

COMMITTEE FOR THE INVESTIGATION OF ATMOSPHERIC POLLUTION.

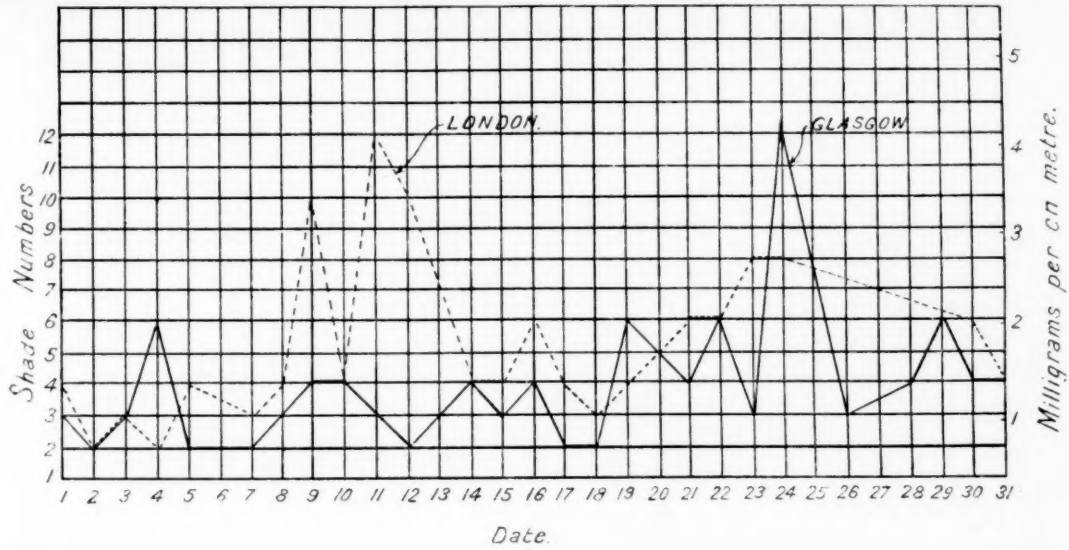
REPORT ON AIR FILTER OBSERVATION AT _____ Month of _____ 191

Day		A.M. 1	2	3	4	5	6	7	8	9	10	11	NOON. 12	P.M. 1	2	3	4	5	6	7	8	9	10	11	12	Day
1	Shade No.																									1
	Remarks																									
2	Shade No.																									2
	Remarks																									
3	Shade No.																									3
	Remarks																									
4	Shade No.																									4
	Remarks																									
5	Shade No.																									5
	Remarks																									
6	Shade No.																									6
	Remarks																									
7	Shade No.																									7
24	Remarks																									24
25	Shade No.																									25
	Remarks																									
26	Shade No.																									26
	Remarks																									
27	Shade No.																									27
	Remarks																									
28	Shade No.																									28
	Remarks																									
29	Shade No.																									29
	Remarks																									
30	Shade No.																									30
	Remarks																									
31	Shade No.																									31
	Remarks																									

The standard volume of air to be filtered is 2 litres, but if this does not give any record two or more standard volumes may be used, in such case the number entered opposite "Shade No." must be the actual number on the scale of shades divided by the number of standard volumes filtered.

Opposite "Remarks" note whether sunny, dull, raining, foggy, etc.

FIG. 6.—CURVES PLOTTED FROM STANDARD FILTER RECORDS. GLASGOW AND LONDON (M.O.). DEC. 1914.



In respect of the accepted standard of pure air. It is very curious to observe that, whereas all known transmissible diseases depend on the access of solid particles in the form of microbes to the body, the efforts of ventilation experts are apparently based on the assumption that gases are the injurious things. We have as yet advanced little in practical work beyond what may be called the CO_2 stage, in which a perfectly harmless gas is treated as if it were a poison. Surely, now that we know that diseases are not transmitted by gases, it is time to direct our attention to the true offenders, i.e., the suspended solid impurities, and leave the harmless CO_2 in peace. It is suggested, therefore, that investigations into the suspended impurities are likely to prove of far greater hygienic value than any measurements of harmless gases.

The instrument now described makes no pretence, in the present form, to discriminate between harmless and harmful impurities. Experiments have, however, been started, with a modification of the apparatus, on the bacteriology of the air and its relation to smoke contents. Up to the present these experiments have only aimed at finding a form of filter which is capable of removing all the bacteria from a measured volume of air, as the filter-paper does with the dust, and at the same time permits a culture to be made from the filter in such a form that the bacteria can be counted. This aspect of the question is one which cannot be adequately dealt with here.

The distribution of smoke in city air, both vertically and horizontally, would be a suitable subject for experiment. Is the air purer near the ground-level or near the tops of high buildings? Which suburbs of a city have the purest air? These and similar questions are of practical hygienic importance.

Again, the instrument provides a very simple means of testing the efficiency of the screens or filters used in the case of buildings ventilated on some system which is supposed to cleanse the air before admission; it is a simple matter to take samples from outside and inside the building simultaneously and compare the relative amounts of dirt found in each. It is to be feared that in many cases the results would be anything but reassuring.

The advantage of being able to keep records of the state of the air and the density and number of dirty fogs in a city should be of great benefit and would show not only the state of the air in one city as compared with another, but also whether the air was becoming purer or more polluted.

The relation between the incidence of respiratory diseases and the death-rate from them might on investigation be shown to bear some relation to the quantity of suspended impurity, and if found to rise and fall with the quantity of dirt in the air this would be a powerful inducement to sanitary authorities to try to cleanse the air of their cities. At any rate, until and unless such points are made the subject of careful investigation, any statement as to the relation between atmospheric pollution and such diseases can be only of comparatively little value.

Calibration of Dr. Owens's Apparatus for the Estimation of Suspended Solid Pollution in the Atmosphere.

Report by J. G. CLARK, F.C.S.

The work of co-relating the arbitrary scale of shades with absolute gravimetric measurements of the suspended solid atmospheric pollution promised to involve a considerable amount of experimental work. And as I happened to have appliances and facilities by which this could be done I offered to place these at the disposal of the Committee.

A number of absolute measurements have since been made and compared with the arbitrary scale of shades, and I now have pleasure in submitting the following summary of the work:—

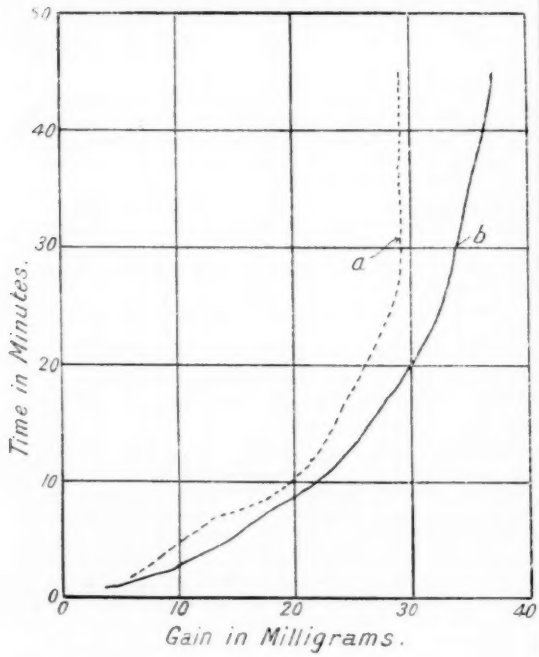
As previously mentioned, Dr. Owens's apparatus permits of rapid and therefore frequent estimation of the solid atmospheric pollution. This advantage

is primarily due to the fact that the filter disc is only $\frac{1}{8}$ inch diameter. The weight of the deposit received on such a small area would therefore have no appreciable value, so that for the purpose of gravimetric calibration another and larger filter capable of receiving a larger quantity of solid atmospheric pollution had to be devised.

The apparatus subsequently used provided a circular filtering surface $2\frac{1}{2}$ inches in diameter—that is, 400 times the area of the smaller ($\frac{1}{8}$ inch) disc, so that for the same depth of shade the mass of filtered matter was 400 times as great as that received on the smaller disc.

It was thought that the $2\frac{1}{2}$ inch disc would be large enough to permit of gravimetric determination of the solid matter intercepted by it and also of comparison with the arbitrary scale of shades; in that way the weight and shade values could be co-related. It was found, however, that the weight of the filtered matter so obtained was still very small (from 2 to 10 milligrammes) for shades up to 20 on the arbitrary scale, and in view of the known difficulties of weighing connected with the hygroscopic nature of the paper used for the filter it was felt that some elaboration would be necessary to procure results precise enough for the purpose. In these early measurements the filter consisted of two similar $2\frac{1}{2}$-inch discs arranged one behind the other, the rear one being used as a counterpoise. Apart from the question of the small mass of the

FIG. 7.—ILLUSTRATING CHANGE OF WEIGHT OF (*a*) CLEAN FILTER PAPER; (*b*) FILTER CONTAINING DEPOSIT; DUE TO ABSORPTION OF WATER.

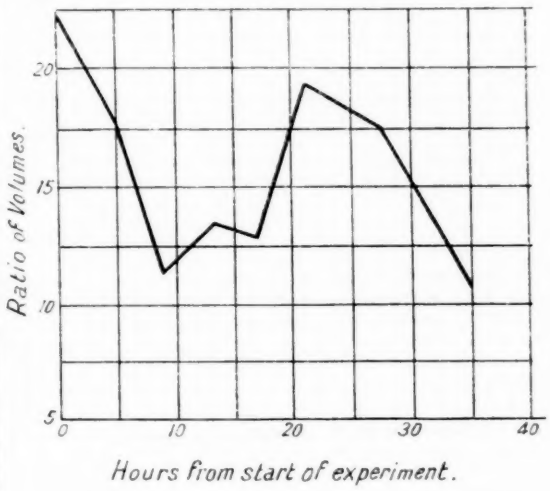


deposit, it was found that the hygroscopic behaviour of the disc containing the deposit was different from that of the clean one which was used as a counterpoise. The difference in the behaviour of the two papers on exposure to the same air simultaneously is illustrated in Fig. 7.

In order to get over these difficulties it appeared obvious that heavier deposits should be obtained, but there was a practical limitation to development in this direction—namely, the difficulty in assessing the shade value of very heavy deposits. It is possible for a filter to be so black that if several times as much deposit is superimposed upon it the increase in blackness is inappreciable.

At this stage Dr. Owens made a suggestion which seemed to offer a solution to this difficulty. The suggestion was that two similar but quite independent filters should be used, one passing, say,

FIG. 8.—ILLUSTRATING VARIATION OF "RATIO."



10 times as much air as the other, and therefore receiving 10 times as much deposit. One may be designated the heavy filter and the other the light.

It was clear that if the light filter could be co-related with the arbitrary scale of shades, and the ratio of volumes of air through the two filters known, a shade value could be calculated for the heavy filter, although it would be impossible to compare it directly with the scale of shades.

If, for instance, the light paper matched shade 10 on the scale, and the ratio between the volumes of air that passed through the two filters was as 15 to 1, then the deposit on the heavy filter would be equal to $15 \times 10 = 150$ on the scale of shades.

With certain precautions to be referred to later, the relatively large quantity of matter received on the heavy filter permitted of its accurate weighing; therefore, knowing both the weight and shade value of the heavy deposit, the gravimetric equivalent of each unit of shade could be arrived at.

The method pre-supposed two things, namely:—1. That the two filters (heavy and light) were in use at precisely the same time, so that they would both receive air of exactly the same degree of pollution. 2. That the ratio of the volumes of air aspirated through the two filters was constant and known.

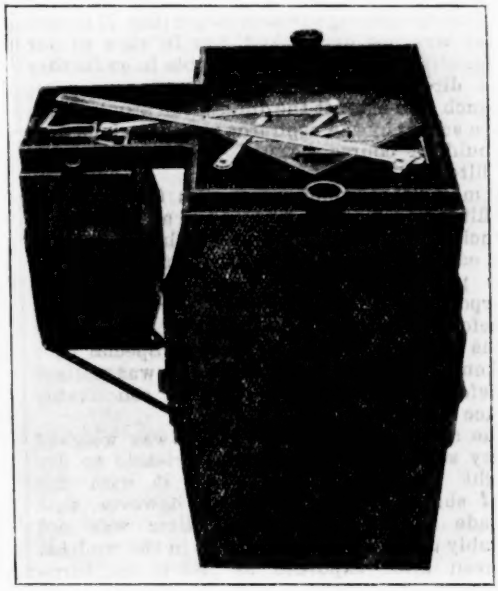
In regard to 1, frequent measurements throughout the day have shown that the suspended pollution varies enormously from hour to hour, and it was useless therefore to compare the heavy and light filters unless they were in operation during exactly the same periods. This led to the adoption

of two gas meters for the separate measurement of the air that passed through each of the filters. The aspirator consisted of a reversed gas compressor so arranged that it sucked the air through the filters and then through the meters. The two filters with their respective meters were arranged in parallel, so that one aspirator served for them both, a valve being fitted to the filter to control the ratio. The air was, of course, measured in the meters under a negative pressure, amounting in the case of the heavy filter to a head of mercury between 5 and 6 inches high, and in the case of the light filter to about 3 inches head of water. These pressures were determined so that afterwards a correction could be applied to the volumes indicated by the meter readings. It may be mentioned here that the large meter had to be specially reinforced to support the external atmospheric load due to the negative pressure inside. The front and back surfaces of the large meter each have a projected area of 440 square inches, so that with 6 inches head of mercury the load on these surfaces corresponds to nearly 1300 pounds. The need for reinforcement will therefore be readily seen. It will be understood that the special reinforcement applied only to the outer case. The internal structure, reciprocating diaphragms, and control valves had reduced pressure on both sides, so that their equilibrium was always ensured, no special provision being necessary.

FIG. 9.

In regard to 2, a difficulty was found in preserving a constant ratio between the air that passed through the two meters. The resistance of the filters to the passage of air through them increased as the pores of the paper became clogged with solid pollution; and as the accumulation on one filter was several times as great as that on the other the air naturally exhibited a preference for the path of least resistance, thus completely upsetting the ratio. The volumes of air that passed through the respective meters were frequently noted, so that the variation of the ratio was known. Fig. 8 shows the sort of variation that took place. The upward and downward form of the curve was due to the attempts that were made to regulate the ratio by the valve on the small meter. However, no sooner was the ratio restored than it began to decline again, and so on. Under these conditions the only thing that could be done was to deduce from the curve a mean ratio and to use this for the calculation. This, however, could be satisfactory only so long as a constant degree of atmospheric pollution during the experiment could be assured, and as this was impossible a new plan had to be devised. Fig. 9 shows the arrangement of meters and filters as tried at first.

FIG. 10.



The difficulty was solved by a special device which ensured that the two meters aspirated at a constant volumetric ratio. The mechanisms were coupled together by a link motion so that they each worked at exactly the same rate of rotation, any tendency for one to run faster than the other causing the faster one to motor the slower. Fig. 10 shows a top view of the two meters with the interlocking gear. In this way the ratio of the volumes aspirated through the two filters was kept absolutely constant, the value of the ratio depending upon the sizes of the meters. In the case of the meters actually used for these experiments the ratio was about 10 to 1—that is, the large meter passed ten times as much air per revolution as did the smaller one.

Even with the interlocking gear just described some considerable care was necessary to get satisfactory results owing to the fact that the mechanism of the meters was not strong enough to bear a too large difference in load; that is, when the heavy filter began to offer resistance to the passage of the

air the small meter began to motor the large one, and if the meters were left entirely to themselves this motoring effect became so great as to cause the mechanism to break down. It was found necessary to make occasional adjustments so as to minimise as much as possible this motoring effect and so relieve the mechanism of undue strain.

In devising this "twin-meter" method the possibility of using filtering surfaces larger than 2½ inches diameter was not overlooked, but in view of our experience it was deemed inadvisable to go further in this direction. The difficulty of supporting the 2½-inch disc against the differential atmospheric pressure set up by the aspirator was a serious one, and would, of course, be still more serious with larger filters.

The method of weighing was as follows: The heavy filter was dried for 24 hours at 100° C. and then enclosed between a pair of watch-glasses with ground edges secured together by a metal clip. A similar pair of watch-glasses were used as a counterpoise. The difference in the weight of the filter before and after the filtration of the air was taken as the weight of the deposit. Special care was taken in this part of the work, as it was realised that defective manipulation could conceivably introduce large errors.

As the deposit on the heavy filter was weighed in a dry state it was considered advisable to dry the light filter before comparing it with the scale of shades. It was observed, however, that the shade value of the dried filter was not appreciably different from its value in the undried state even after exposure to 100° C. for three days.

It was also observed that the deposit on the light filter was remarkably uniform considering the large area of the exposed surface. No appreciable difference was observed in any of the experiments.

Owing to the high pressure-difference between the two surfaces of the heavy filter it was found necessary to provide a support in the shape of a light metal cross, the arms of which were about ⅛ inch wide. Without the cross support the filter frequently collapsed and thus ruined the experiment.

It was interesting to observe that during the first few hours the presence of the cross support was made clearly evident by the part of the filtering surface immediately adjacent to it remaining relatively clean, while the other part rapidly darkened. The contrast, however, subsequently disappeared the whole surface becoming equally dark. Incidentally, the disappearance of the contrast affords an interesting confirmation of the remark made earlier in this report—namely, that it is possible for a filter to become so black that if the deposit upon it is multiplied several times no increase in blackness is appreciable.

It may be mentioned here that several of the heavy filters were treated with benzene and a very appreciable quantity of oily matter extracted. No systematic observations, however, were made on this aspect of the question.

In anticipation of a possible question, I would point out that the efficiency of the filter was perfect, that is, it did not allow any solid particles to pass through. This was proved on several occasions by arranging two filters in tandem, one immediately behind the other, but in no case was the second filter discoloured.

The following is a summary of the experimental data that has been obtained:—

Summary of Results.

No. of experiment.	Period of experiment.	Shade no. of light filter.	Weight of heavy filter.	Ratio of volumes.	Milligrammes per shade.*
			mgs.		
1	Jan. 5th to Jan. 7th	15	36½	9·75	0·250
2	,, 9th ,, ,, 14th	20	50	9·50	0·263
3	,, 30th ,, Feb. 2nd	15	32	9·17	0·233
4	Feb. 8th ,, ,, 11th	23	56½	9·34	0·263
5	,, 12th ,, ,, 13th	10½	17	10·9	0·150
6	Mar. 2nd to Mar. 6th	24	55	9·23	0·247
7	,, 8th ,, ,, 11th	25	57	9·0	0·253
8	,, 16th ,, ,, 17th	9½	24½	9·6	0·270
9	,, 24th ,, ,, 25th	11	28½	10·2	0·255

* The method of arriving at this figure is clearly indicated in the detailed summary given further on.

As has already been shown, there appears to be a shade value beyond which it is impossible to go, even if much more deposit is superimposed upon it. This being so, it would appear as though the gravimetric value per shade would be higher with the higher shade values. The above figures, however, do not indicate any tendency in this direction; in fact, it appears that from the nature of the experiments no very fine distinctions can be drawn. Arranged in order of the shade values of the light filters we get the following summary:—

Shade number of light filter.	Milligrammes of deposit per shade.
9½	0·270
11	0·255
15	0·233
15	0·250
20	0·263½
23	0·263
24	0·247
25	0·253
Average	0·254 milligramme per shade.

The results of No. 5 experiment have been omitted in arriving at the average; it seems so obviously an error.

The calibration figure, namely, 0·254 mg. per shade on a 2½-inch disc, can be applied to Dr. Owens's filter in the following way:—

1. The area of 2½-inch disc. is 400 times as great as a 1/8-inch disc—the weight of the 1/8-inch deposit will be $\frac{0{\cdot}254}{400}$ mg. per shade.

2. If two litres of air be taken as the standard volume to be aspirated through the 1/8-inch filter, then the weight of suspended matter in the air calculated to milligrammes per cubic metre will be $\frac{0{\cdot}254 \times 1000}{400 \times 2} = 0{\cdot}317$ mg. per shade.

If in a particular room the stain corresponds to shade 10 on the scale, it will be equivalent to 3·2 milligrammes per cubic metre of air.

DETAILED SUMMARY OF EXPERIMENTS.

Experiment No. 1.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
Jan. 5th	29·63	11.12	3.10	450	30	5·6 Hg.	0·22	360	30
,, 6th	29·93	10.20	3.20	480	50	5·8	0·23	386	50
,, 7th	29·41	10.0	4·50	790	60	5·9	0·26	619	60
				1720	140			1365	140

Ratio of volumes, 9·75. Shade of light filter, 15. Weight of deposit on heavy filter, 36½ milligrammes. = 0·250 milligramme per shade.

Experiment No. 2.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
Jan. 9th	29·59	9.54	12.45	540	45	5·6	0·17	428	45
,, 11th	29·45	9.15	12.20	740	60	5·7	0·20	586	60
,, 12th	29·96	10.10	3.0	510	50	5·7	0·23	412	50
,, 13th	30·05	9.45	3.20	550	40	5·9	0·24	443	40
,, 14th	30·10	9.45	4.35	740	65	5·7	0·27	602	65
				3080	260			2471	260

Ratio of volumes, 9·5. Shade of light filter, 20. Weight of deposit on heavy filter, 50 milligrammes. = 0·263 milligramme per shade.

Experiment No. 3.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
Jan. 30th	30·01	9.59	12.40	380	30	5·4	0·24	311	30
Feb. 1st	30·02	9.30	3.15	630	55	5·8	0·26	507	55
,, 2nd	29·82	9.30	2.5	690	65	5·6	0·37	557	65
				1700	150			1375	150

Ratio of volumes, 9·17. Shade of light filter, 15. Weight of deposit on heavy filter, 32 milligrammes. = 0·233 milligramme per shade.

Experiment No. 4.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
Feb. 8th	29·78	9.50	3.0	1020	90	5·8	0·18	816	90
,, 9th	29·50	9.0	4.0	1420	130	5·8	0·23	1122	130
,, 11th	29·76	9.0	4.50	730	50	5·8	0·26	583	50
				3170	270			2521	270

Ratio of volumes, 9·34. Shade of light filter, 23. Weight of deposit on heavy filter, 56½ milligrammes. = 0·263 milligramme per shade.

Experiment No. 5.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
Feb. 12th	29·43	11.0	4.45	770	50	5·8	0·23	606	50
,, 13th	28·85	9.20	12.40	350	30	5·8	0·25	269	30
				1120	80			875	80

Ratio of volumes, 10·9. Shade of light filter, 10·5. Weight of deposit on heavy filter, 17 milligrammes. = 0·15 milligramme per shade.

DETAILED SUMMARY OF EXPERIMENTS—*(continued)*.

Experiment No. 6.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
March 2nd ...	30·02	10.8	7.15	1250	110	5·5	0·22	1030	110
,, 3rd ...	29·95	9.30	6.50	1250	100	5·8	0·26	1006	100
,, 4th ...	30·09	9.20	4.30	870	80	5·8	0·33	704	80
,, 5th ...	30·15	10.0	4.45	810	80	5·8	0·31	657	80
,, 6th ...	30·06	9.0	12.20	365	30	5·8	0·31	295	30
				4555	400			3692	400

Ratio of volumes, 9·23. Shade of light filter, 24. Weight of deposit on heavy filter, 55 milligrammes. = 0·247 milligramme per shade.

Experiment No. 7.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
March 8th ...	30·30	9.35	6.5	1095	110	5·8	0·25	894	110
,, 9th ...	30·48	9.30	6.0	830	60	5·8	0·26	683	60
,, 10th ...	30·23	9.30	4.30	610	60	5·8	0·28	497	60
,, 11th ...	30·08	9.35	6.45	1440	130	5·8	0·22	1165	130
				3975	360			3239	360

Ratio of volumes, 9·0. Shade of light filter, 25. Weight of deposit on heavy filter, 57 milligrammes. = 0·253 milligramme per shade.

Experiment No. 8.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
March 16th ...	30·17	2.30	7.0	810	60	5·8	0·26	658	60
,, 17th ...	29·93	9.45	4.30	675	65	5·8	0·26	543	65
				1485	125			1201	125

Ratio of volumes, 9·61. Shade of light filter, 9½. Weight of deposit on heavy filter, 24½ milligrammes. = 0·27 milligramme per shade.

Experiment No. 9.

Date.	Barometer (inches).	Time.		Volumes uncorrected.		Pressure.		Volumes corrected.	
		Started.	Stopped.	Large.	Small.	Large.	Small.	Large.	Small.
		A.M.	P.M.						
March 24th ...	29·97	11.0	7.0	1330	105	4·7	0·18	1120	105
25th ...	30·17	11.0	5.0	850	75	4·7	0·18	720	75
				2180	180			1840	180

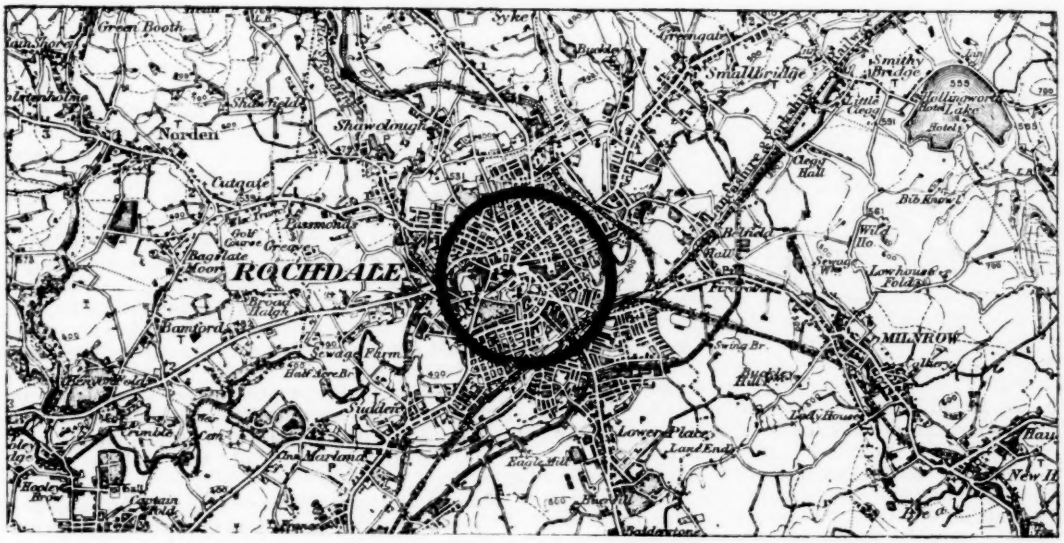
Ratio of volumes, 10·2. Shade of light filter, 11. Weight of deposit on heavy filter, 28½ milligrammes. = 0·255 milligramme per shade.

MAPS OF DISTRICTS SHOWING POSITIONS OF THE STANDARD GAUGES

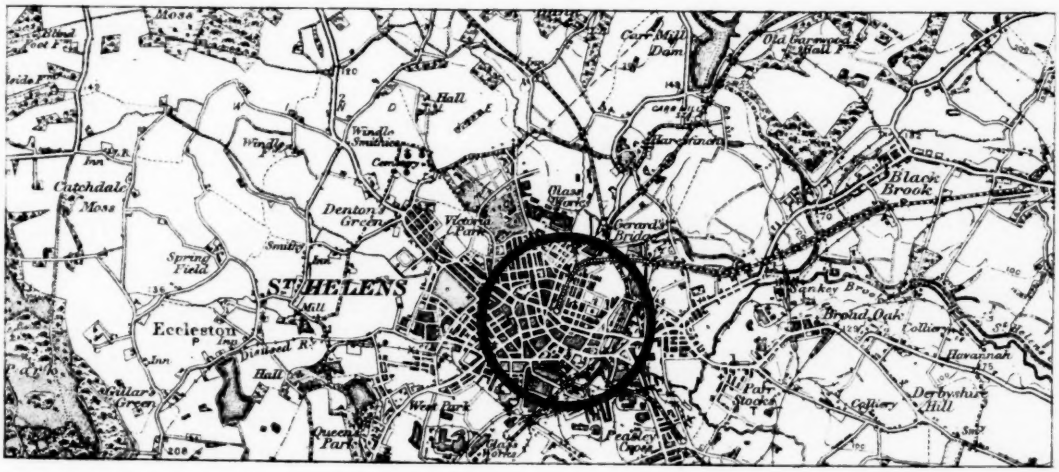
ADDITIONAL TO THOSE GIVEN IN PREVIOUS REPORTS

(*SCALE, ONE INCH TO THE MILE.*)

ROCHDALE



ST. HELENS



EXPERIMENTAL WORK IN HAND.

The Committee are now engaged in experiments directed towards finding the best method of measuring continuously the amount of suspended impurity in the atmosphere. The greatest difficulty in connexion with this centres round the fact that to abstract weighable quantities of suspended impurity from the atmosphere, and particularly quantities suitable for analysis, involves the treatment of extremely large volumes of air.

The following volumes of air filtered and weights of deposit caught are taken from the experiments already described in connexion with the calibration of the above filter.

Experiment.	Volume filtered.	Weight of deposit.	Experiment.	Volume filtered.	Weight of deposit.
	cu. metres.	mg.		cu. metres.	mg.
1	38·6	36½	6	102	55
2	70	50	7	92	57
3	39	32	8	34	24
4	71	56½	9	52	28½
5	25	17			

It will be seen from these that the amount of suspended impurity in the air of London at the time of the experiment varied from about ½ to 1 mg. per cubic metre, so that to obtain, say, 100 mg. would involve the treatment of from 100 to 200 cubic metres of air, which implies either the use of very large and costly apparatus or the spreading of the test over such a long period as to make it useless for most purposes. For example, to obtain the 55 mg. of deposit referred to in Experiment 6, already quoted, required the aspiration of 102 cubic metres of air and occupied 34 hours' continuous aspiration through a 2½-inch diameter filter-paper. It is fairly obvious therefore that there are considerable difficulties in the way of obtaining a sufficient amount of suspended impurity for analysis; on the other hand, the method of measurement by shade of record, as already referred to, may be developed so as to give the chief part of the information required. Experiments were made with a view to ascertaining whether the amount of obstruction of the pores of a filter-paper through which air was aspirated could be taken as a measure of impurity. It was found that the amount of obstruction of the pores could be measured by taking the time required to aspirate a fixed volume through a disc of filter-paper, means being adopted to keep the difference in pressure on each side of the filter-paper constant.

A series of 16 experiments were made, in each of which two litres of air were drawn through the standard paper used for the Owens filter, but each volume of two litres was drawn through the same disc, so that, assuming the state of pollution of the air did not vary during the experiment, No. 1 would receive, say, a unit quantity of deposit and the succeeding ones quantities proportional to their number, No. 10, for example, receiving 10 units of deposit.

It was found that there was a regular increase in the time required for filtration, but it was at a very slow rate as the air was comparatively pure at the time, but it indicated roughly that while air containing about 0·32 mg. per cubic metre passed through the paper at the rate of two litres in four minutes, when 30 litres of this air had passed through the paper the time occupied by the sixteenth volume of two litres was only increased to 5·45 minutes. Of course, the total time occupied depends also upon the difference in pressure produced on each side of the paper, and the figures now given are simply for comparison between themselves.

Should the method of measurement based upon the obstruction of the pores of the paper prove effective, it would be preferable in at least one respect to measurement by shade of record given by aspiration through white filter-paper, as it would be independent of the colour of the impurity.

The Committee's experiments on the subject of obtaining continuous records of pollution from hour to hour or day to day will not be completed for some months, but it is hoped that the results will be ready for the next annual report.